# AGE-STRUCTURAL TRANSITIONS: CHALLENGES FOR DEVELOPMENT

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CICRED

Committee for International Cooperation
in National Research in Demography

Paris

2006

Chapters in this volume originate from papers presented at an interregional seminar held in Paris, France, 23-26 February, 2004, in collaboration with the "Institut National d'Etudes Démographiques". The seminar was organized by Ian Pool who also acted as scientific editor for the present volume with Laura R. Wong and Eric Vilquin, CICRED series editor.

The seminar and this publication have been supported by the United Nations Population Fund (UNFPA).

Cover by Nicole Berthoux (INED)

Illustration: adapted from Katsushika Hokusai

First published in 2006 by CICRED



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ISBN: 2-910053-27-X

**ACKNOWLEDGEMENTS**

The seminar on which the chapters in this book are based was funded by the United Nations Fund for Population Activities who must be thanked for this initiative. Of course, the views expressed here do not necessarily represent those of the agency. The active participation of an official from that agency, Dr Kourtoum Nacro, at the seminar greatly enhanced the work of the seminar, and was much appreciated by all participants.

The seminar was very much the idea of the former Director of CICRED, Dr Philippe Collomb, who secured its funding and who actively encouraged its editing and publication. A special vote of thanks is thus due to him.

All authors benefited from the fact that during the seminar a number of researchers from INED and other agencies participated, and that several acted as discussants and session chairs. In particular one must thank Drs Jean-Louis Rallu and Jean-Claude Chesnais, the latter of whom made major interventions of significant value during the seminar, and was also the chair and discussant for the seminar at INED at which this book was launched on June 30th, 2006. The Book was also launched on July 4th at the Asian Research Institute, National University of Singapore in a ceremony arranged jointly by the Institute and the Meta-Centre for Population at the National University, and at which a number of the authors participated. Thanks are due to Professors Gavin Jones and Angelique Chan for arranging this launching.

Last, but certainly not least, all the participants and the editors wish to thank Ms Hartati Ayral, general secretary at CICRED who ensured the smooth running of the seminar. All activities before and since fell on her shoulders, including coordinating the editing and arranging the launching in Paris, and we have a deep debt of gratitude for her superb organisation and management of this undertaking. She, in turn gained support from Silvia Huix-Adamets whom we wish to thank most sincerely.

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# *Part I*

## *THE TIME HAS COME THE WALRUS SAID TO SPEAK OF OTHER THINGS, OF COHORT FLOWS AND DIVIDENDS THAT THIS MOMENTUM BRINGS…*[1]

1. With profound apologies to Lewis Carroll.

# 1

# AGE-STRUCTURAL TRANSITIONS AND POLICY: AN EMERGING ISSUE

**Ian POOL**[1]

**Laura RODRÍGUEZ WONG**[2]

***Abstract***

In mathematical demography age-structural changes have long been a major interest, yet this has not translated across into empirical analyses to any great degree, beyond the use of simple descriptive indices and techniques such as age pyramids and dependency ratios. The most extensive research has been on ageing, that represents only one phase of an age-structural transition (AST). Recently, however, there has been an upsurge in interest in the demographic and policy implications of the passage of generations/cohorts of differing sizes across key life-cycle stages. The impacts seem to be positive and the trends deterministic, and thus have been termed "demographic bonuses/dividends", although studies that developed independently in Latin America take a more neutral position pointing to a "window of opportunity". The difference is that bonus suggests a very deterministic path, a virtual certainty, window of opportunity suggesting instead that to gain from ASTs while the window of opportunity is occurring requires some proactive inter-

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ventions. A different approach, the more detailed analysis of cohort flow shows that age-structural transition, far from being monotonic and systematic across population at the same stage of demographic transition, may be disordered, thus making proactive policy formulation and implementation more complex. These different paradigms and related methodological issues are discussed here.

## 1. The Significance of Age Structure for Policy and Development

In a recent study published by RAND, David Bloom, David Canning and Jaypee Sevilla (2003) succinctly outlined a theme underlying the questions to be discussed in the chapters in this book. Thus their study has set out for us parts of the agenda to be pursued here. Their focus, it is true, was on macro-level economic development, but what they are saying carries across into every policy domain, including social and environmental. One can go further than this and argue that their analysis also has implications at the micro and family level. To quote from their abstract:

> "For decades, economists and social thinkers have debated the influence of population change on economic growth. Three alternative positions define this debate: Population growth either (1) restricts [what they call the *pessimistic* theory], (2) promotes [the *optimistic* theory], or (3) is independent of economic growth [the *neutralist* theory]. Proponents of each explanation can find evidence to support their cases. All of these explanations, however, focus on population size and population growth. In recent years, however, the debate has given insufficient attention to a critical issue: the *age structure* of the population (that is the way in which the population is distributed across different age groups), which can change dramatically as fertility and mortality rates change… Because people's economic behaviour and needs vary at different stages of life, changes in a country's age structure can have significant effects on its economic performance" (Bloom *et al.* 2003: xi).

The recognition of the applied importance of age structure as a factor in economic change and thus policy has come about very recently. As there had been an historical interest in this question, particularly among theoretical mathematical demographers (e.g. Keyfitz 1968)

treating it both as an issue in its own right, and because of an interest in the properties of stable and quasi-stable population models, the puzzle is why empirical interest in the topic came about so late. Without delving into epistemology, it does seem that concerns over the high growth seen in the post-war United Nations projections and similar forecasts drove the development of methodologies in demography that could allow these trends to be mapped more accurately (e.g. indirect estimation of vital rates). At a more theoretical level, and until ageing became an emerging issue, this led to a focus in the demographic community on dynamics, on demographic transition and migration, rather than on structures. Conversely, in applying demography to development issues, the use of blunt indicators of population size and growth in planning meant that the integration of demographic factors into economic planning models was not very satisfactory at an operational level (UNFPA 1989; Pool 1994a).

## 2. Emerging Paradigms

By the late 1990s, however, an interest in age structure in relation to policy was starting to emerge. It seems to have evolved from at least four research paradigms, all of which are represented by work carried out by various authors of chapters in this book.

Firstly, and most importantly until now, there is a general interest in ageing that was referred to above, and which goes back at least until the 1980s. Concern in the developed countries, particularly by member states of the United Nations in the Economic Commission for Europe, resulted in a special section on this being devoted to the topic in the Programme of Action produced by the *International Conference on Population and Development* (*ICPD*,[3] Cairo, 1994).

But the impact of this paradigm has been much more than this. Thus, the issue has also been advocated as among priorities in the developing world, even in Africa where structural ageing (the per cent of

3. With only six per cent of the world's population being aged at this time. In contrast, apart from their sexuality which received a lot of attention, youth (aged 15-24 years) who constituted almost 20 per cent of the globe's population received little acknowledgement. In the part of the document titled "Actions" only one paragraph (6.13) referred to them: "Countries should aim to meet the needs and aspirations of youth, ensuring their integration and participation in all spheres of society".

the population at older ages) is a distant prospect. Among developing countries that will see ageing sooner than that, however, is China. Its State Planning Commission research groups, of which Yan Hao, a chapter author here, is a member, have paid a great deal of attention to this issue, along with other aspects of their age-structural transition (AST).

Ageing is certainly the most widely referred to aspect of ASTs in policy and political circles, and even among scientists. But the problem with a great deal of the focus on ageing *per se*, such as at the ICPD and in some research, and certainly in much of policy dealing with age-compositional issues, has been that it has put most emphasis on this one phase of an age-structural transition. At the same time it has essentially neglected much of the rest.

In contrast, the remaining three paradigms, to be discussed below, cover the whole transition. In keeping with this approach, the present monograph will deal with ageing only in passing as a part of a wider analysis of age-structural transitions.

Secondly, and in this latter vein, there is the work of Bloom and his colleagues, represented in this volume by the paper by Bo Malmberg and Thomas Lindh, stressing age structure, and also focussing on the benefits, "demographic dividends" or "bonuses", that age-structural changes may produce for many countries, especially developing ones. The roots of their paradigm go back to the 1980s, although the "seminal Coale-Hoover study…[1958]" provides an exceptional example of such an approach far earlier than this (Bloom *et al.* 2003: 20).

This paradigm sees societies going through a series of broad age-structural changes over long time periods. These phases are determined by the relative weights of each of the major life-cycle stages, measured by the proportions at young, intermediate or older ages. At an early stage the population is disproportionately weighted towards childhood; at the middle phase the working ages dominate; and at a late stage the oldest ages dominate. The "demographic dividend" arises when the society is at a middle phase and dependency ratios are low.

Thirdly, seemingly overlapping with this model but in fact coming from a different demographic tradition and thus carrying different implications, is the emphasis, particularly in Latin America, on "windows of opportunity". In this volume the difference in emphasis between the two models is seen as being between a change that is deterministic (as was the case historically – see Malmberg and Lindh's chapter), and that will produce a dividend, and the idea that such a dividend can be real-

ised on only if the window of opportunity it affords is exploited. Implicit in this third paradigm is the notion of choice: that an opportunity exists, but is one that can be realised on only if policymakers exploit it effectively.[4]

The notion of a "window of opportunity" was first developed by José de Carvalho (1988) referring to the AST that Brazil had started some 20 years earlier. He also noted that, although there were clear signals on the new age patterns and the imminent ageing process, these changes were ignored by policymakers. In a later paper based on additional evidence from the 1990 census data on Brazil, Carvalho and Wong (1998)[5] argued that demographic changes represent a window of opportunity that could be taken advantage of at the turn of the 21st century. Other Latin American Demographers like Stern and Tuirán (1993), from Mexico, also incorporated the concept of "demographic bonus". They recognized the profound demographic mutations (to draw on the useful term employed by the Belgian demographer Michel Loriaux, 1990) that had occurred in Mexico at the last part of the 20th century, creating a demographic bonus that the society should attempt to exploit in the 21st.

This model was carried far beyond Latin America by Carvalho in his Presidential address to the IUSSP at the *Beijing General Conference* (1997). As is clear in the paragraph above, a colleague of his and a critical contributor to this model has been Laura Rodríguez Wong. She is co-editor of this volume, and co-author of this chapter (she develops the model further in a Brazilian case study in her chapter co-authored with Carvalho later in the book).

A fourth AST paradigm comes from the IUSSP Committee on Age Structure and Policy of which Ian Pool is a member, and which is chaired by Shripad Tuljapurkar of Stanford University. Formed in

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4. The work of Ian Pool in New Zealand shows that the increased birth cohort sizes of the "baby-blip" of around 1990 will produce large flows of young workers into the labour market around 2010. This is thus a "window of opportunity", but will have positive outcomes only if there is investment in human capital. If this population wave is not responded to in this way this will be not merely an opportunity lost but will result in increased fiscal burdens and disinvestment in welfare necessary to sustain young un- or under-employed (Pool 2003). "Opportunities" are thus also potential risks. For another example see Wongboonsim (2004).

5. It was George Martine, who actually used the term "window of opportunity" when he was editing the paper by Carvalho and Wong (1998) who then decided to incorporate it in the text.

1998, it brought together a range of scholars with interests in age structure – its economic, sociological, anthropological and demographic implications, at both the macro and micro levels. Its mandate has been wide, but with a focus on "age-structural transitions" which the committee has attempted to conceptualise and map. It has also married practical concerns with theoretical and empirical analyses relating to the construction and use of projections in a wide range of settings, and the application of these to public policy issues.[6]

In his work linked to presentations to the IUSSP committee (Pool 2005 and under editorial review), and building on an invited paper to the Association canadienne-française pour l'avancement des sciences (Pool 2000), Pool developed a transition model that has some of the elements seen in the work of Bloom and Malmberg, and their colleagues noted above, but goes further by introducing cohort and momentum dimensions. It also follows changes over very much shorter periods. It posits several phases:

*Stage I: Simple Momentum*, with subphases of constant momentum, and accelerating momentum, characterised by almost a "tidal wave" effect. A number of African countries are at this phase at present.
*Stage II: Population Waves*, with subphases of simple oscillation, linked to decelerating momentum, double and multiple oscillations, both subphases likely to be typified by disordered cohort flows.
*Stage III: Ageing*, with a first subphase when the total population is still growing, a second when it is stationary, and a third when it is decreasing.[7]

A further dimension to this issue is that the scientist must also recognise that the needs of policymakers are more immediate. Thus there is an interest, that will be developed further in the sole-authored

6. Pool's own interests were at first highly applied, dating back to the 1980s to a global evaluation by UNFPA (1989) of population and development planning which highlighted the relative lack of success of endogenising population into planning. Ian Pool was involved in both the regional (Africa and Asia-Pacific) fieldwork and the global synthesis. See Pool 1994a.

7. The terms population wave and disordered cohort effects come from Keyfitz (see also Rowland 1996). The term momentum as used here differs a little from the way it is defined by, say, Frejka (1982) or Keyfitz (1971), to accord more closely with the definitions employed in physics to mean simply "impetus gained from movement" (*New Shorter OED*: vol A-M, 1810). Frejka's definition is "a property whereby populations change their growth rates in a relatively smooth fashion".

paper of Pool below, in what might be happening over the next decade or so, what might be termed a "partial" transition that is analogous to the computing of "partial" life expectancies in life-table methodologies.

This overview of developments would be incomplete without referring to interactions between the demographic transition and age-structural changes. A major contributor to this research has been Jean-Claude Chesnais of the Institut National d'Études Démographiques (France), although his prime emphasis has been on the determinants of that transition. Nevertheless, he has given precision to the interactions by formulating "a synthetic index [a population multiplier]… [by] which the population is multiplied during the transition". He then recognised that during a transition "the increase in population is not evenly distributed by age" (1990: *passim*). The faster the transition the higher the multipliers, as his comparison between France and Kenya shows:[8]

Transitional multipliers per country, by age

| Ages | Country undergoing AST | |
|---|---|---|
| | France | Kenya |
| Total population | 2 | 20 |
| 0-14 years | 1.5 | 10 |
| 65+ years | 10 | 200 |

As is implicit in the paradigms above and in Chesnais' research, in many senses the term demographic transition is misleading. It only covers part of the way population dynamics and structures change, in terms of natural increase, but not structural changes. But for this paper we will retain the conventional terminology.

8. Two other developing countries covered in this volume are Brazil and Mexico for which these multipliers have also been computed (Wong *et al.* 2000). At older ages they are far more rapid than those for France, but below Kenya's:

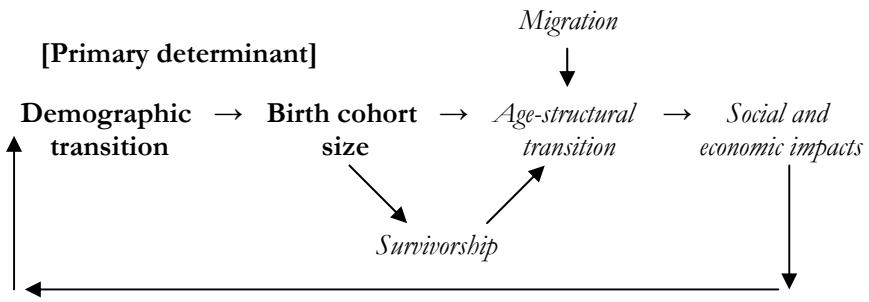
| | Brazil | Mexico |
|---|---|---|
| Total | 3 | 5 |
| 0-14 | 9 | 13 |
| 65+ | 57 | 73 |

## 3. Age-Structural Transitions: Some Theoretical Questions

Over much of the world today age-structural transitions are being produced primarily by changes in fertility resulting from the demographic transition, as narrowly defined (i.e. natural increase), as is shown in Figure 1. It determines the baseline sizes of birth cohorts. These are then mediated by shifts in patterns of survivorship, and in many populations by migration flows (albeit that migration will normally be a less significant determinant of change). Earlier in the demographic transition when fertility levels remained high, a key factor was a decrease in mortality that disproportionately affected younger ages where the force of preventable mortality was highest. Then fertility declines became the factor that most affected age structures. Recently in developed countries improved survivorship at oldest ages is an emerging force, but even there ageing is still mainly a result of low fertility. Finally, and a major issue for this book, is another point indicated in Figure 1: that age-structural transitions have an impact on sustainable social and economic development. They also have feedback effects on the demographic transition through the impacts of age-compositional effects on fertility and mortality.

The linkages between these different factors are shown in Figure 1.

Figure 1
From demographic transition to age-structural transition




A central problem, particularly for planning for sustainable development, is that the birth cohort sizes, and/or shifts in patterns of survivorship, and/or migration flows that modify birth cohort sizes are

not likely to be regular, and, to make this more complicated, will be age-specific and thus have major implications for policy interventions (see below). In some countries and in some eras either may play a major role: the very perturbed structures seen for the Russian Federation or China come from a mix of fertility and survivorship effects, that were irregular both from a temporal standpoint and the degree to which they affected structures. In countries of relatively large population size, migration effects will normally be more marked at a sub-national level than at a national level.

Beyond this, fluctuations in past cohort birth sizes have produced the waves and disordered cohort flows in some countries (e.g. China, Iran and Rumania, each the subject of a special chapter later in this book). Elsewhere, as in Italy or Japan, rapid decreases in fertility will produce highly skewed age distributions, in Italy's case, for example, with higher proportions at some older age groups than at younger ones. But in other countries, such as India and France, shifts in fertility have been less marked and thus perturbations less severe, so that in future France will have a remarkably even composition across age groups, with a bit lower proportion at the older age groups (Pool 2005; Pool, under editorial review).

This raises three important points. Firstly, in studying age-structural transitions it is essential to recognise and build into models the effects of the demographic transition (as defined in this paper). Equally well, however, when loking at the age-structural transition *per se* it is essential to analyse both broader age-compositional changes over time and the cohort flows.

The dynamics of both of these are described by Bloom *et al.* (2003: 30-31; see also Pool 2005). Those authors show how cohorts emanating from periods of high fertility may see their numbers being maintained, relative to previous generations, by improved survivorship, and even declining levels of reproduction being offset to a degree by decreases in infant and childhood mortality. This wave produces momentum as the cohorts concerned pass through the age pyramid. When each of these waves "itself reaches the prime reproductive years, it creates its own echo…", as larger parenting cohorts produce a higher number of births, occurring even if fertility rates have declined. A useful term for this is "secondary momentum", to distinguish it from momentum stemming directly from the original birth cohorts.

The picture is more complex, however, than this description might suggest. Cohort flows may take the form of one or more relatively regular wave(s) moving across the age pyramid, but they are more likely to be disordered flows than simple oscillations, with both volumes and durations for waves and troughs varying irregularly. The broader changes may provide "windows of opportunity" or produce "demographic dividends" over longer terms, or equally well place burdens on fiscality, and the delivery of services across a decade or so. But disordered cohort flows will produce complex age-structural fluctuations over short-term periods thereby posing problems for the realising of dividends, or the planning of responses to burdens induced by the changes. Essentially, the yield for dividends may vary rapidly over short durations while the policymaker will need to plan for on/off-again demands. In short, to appreciate fully the social and economic impacts of age-structural changes it is necessary to move to more refined models that permit the analysis of cohort flows as well as broader age structures.

Secondly, the degree of perturbation of structures is a determinant of the social and economic impacts of an age-structural transition. This can be both in a positive direction, producing "dividends", or in a negative direction by increasing fiscal, service, resource and other economic demands, or on the analogues of these, positive and negative, at the level of the family. Conversely, the degree of perturbation an age structure is subject to also affects social and economic capacities, positively or negatively, across these same factors.

Bloom *et al.* (2003: 39-42) see this positively. They identify the three most important mechanisms that "deliver" the demographic dividend: (1) labour supply, the volume, age distribution and spatial spread of which are demographic questions but the quality and skills of which are due to education and other factors; (2) savings; and (3) human capital, the quantum of which is essentially also a demographic factor, but the exploitation of which is a function of social and cultural norms and the way public and private sector enterprises, and small/family businesses/farms are organised. They go on to say that "the demographic transition has significant effects on investments in human capital, effects which are the least tangible, but may be the most significant and far-reaching". Finally they point out that "All these mechanisms are heavily dependent on the policy environment" (Bloom *et al.* 2003: 41, 42).

Thirdly, the waves continue on into the older age groups. The net effect are shifts in the balance between the older elderly and the younger, and this has major implications for health and welfare policies and services (Pool 2003 for New Zealand). The waves also fashion the long-term relative weighting of the age structure, as comparisons of France and Italy show. In 1960 their age structures were broadly similar, but by 2050 while France will have roughly the same proportions at all fifteen-year age groups except at 75+ years, which is smaller, Italy will see increasingly larger proportions at each successive age group, with this peaking at 70-74 years (Pool, under editorial review).

The emphasis in the chapters in this book is on the developing countries. Most of these, indeed some developed countries as well, are at the second stage of an age-structural transition the framework for which was outlined earlier. A limited number of developed countries in Europe, especially in the Mediterranean Basin, plus Japan seem to have entered the last stage (see Pool 2005; Pool, under editorial review; Bloom *et al.* 2003).

Indeed, some sub-Saharan African countries are only at the first stage of a transition, in the later sub-phase of accelerating momentum coming from declines in infant and childhood mortality in the face of the maintenance of high fertility (see Pool, 2005 and Chapter 2 in this book; Bloom *et al.* 2003). Or, perhaps one should say, were in this first stage – the HIV/AIDS epidemic may significantly alter their transitional path, perhaps causing them to deviate markedly from what has been seen in the past. This epidemic will have two impacts on the sizes and survivorship chances of birth cohorts in the countries most affected. The death of men and women at prime reproductive ages could well reduce the reproductive potential and thus fertility rates, and there also is the effects on children born alive of infant and childhood mortality from secondary infection.

In sum, then, in reviewing age-structural transitions three elements must be covered. Firstly, there is the question of determinants, the demographic transition and migration as affected in turn by age-compositional effects coming from the age-structural transition itself. Secondly, there are the processes by which age-structural transitions themselves unfold. Thirdly, and most importantly perhaps, there are the consequences of these for sustainable development.

The first of these issues is arguably better understood than the other two. The second requires new and improved methodologies to which we turn in the next section of our chapter. In advance let us note that this is not a well-developed area, but that some interesting attempts to develop new techniques will be seen in some of the substantive chapters later in the volume. This volume has substantive papers across different global geographic regions. They typically deal with policy implications. Thus this volume addresses the third question just noted. The last chapter picks up this issue in attempting a synthesis of questions raised in the volume.

## 4. Age-Structural Transitions: Some Methodological Issues

There are four major methodological questions that need addressing if this domain is to progress. Developments here should be treated with the same degree of priority that was accorded indirect estimation of vital rates in the 1960s to 1980s. Then Princeton University's Office of Population Research in its Africa project, along with other work carried out there, assembled a team of scholars whose work built on methodological advances coming from the United Nations Population Division. This spawned a range of new techniques that were collated by Ansley Coale and Paul Demeny in United Nations *Manual IV* (1967) (and subsequently in *Manual X*).

The reason to cite this important precedent is because, as Bloom *et al.* (2003) have signalled, the architecture of the world's population is undergoing a mutation, from trends driven by natural increase and migration to composition being the dominant factor. The emerging structures have implications for development and policy in general that are as urgent as unprecedented accelerating growth was three decades ago. To draw an analogy, demography must shift from an "epidemiological" to a "morphological" focus. Yet it is a sobering thought that, by comparison with the sophisticated techniques available to analyse the way populations grow and move, the methodologies of population morphology are very basic. Moreover, they occupy a minor part of demography's liturgy as a review of any methodological text will show (e.g. Shryock and Siegel 1976).[9]

9. A partial exception is the work of Roland Pressat (e.g. 1978: Chapter 3) that has exploited the analytical utility of cohorts and of the Lexis Diagram for both epi-

A first point is that cohort analysis is central to much of the work in morphology. This is particularly true for that component dealing with issues that have policy implications. The reason is rather simple: the intersection of (a) cohort flows across a given life-cycle stage, with (b) a focus in most policy sectors on the needs of particular age groups (as against the population as a whole), requires analyses that take a cohort approach. This permits assessments to be made of fluctuations in levels of need, as cohorts of varying sizes arrive at different life-cycle stages. Although this branch of demographic analysis has been directed to more "epidemiological" ends, it has a major role in the area of population "morphology", as Norman Ryder has demonstrated over the years (e.g. 1965).

This becomes significant in the second question to be raised here: the measurement of wave effects, especially when cohort flows create situations of turbulence. Typically, the case studies here use conventional indices of age structure based around time-series analyses of period observations. Pool in his case study here attempts to capture wave effects by employing as a denominator the total population at time $t$, and then computing the proportionate significance of age-specific changes, the numerator statistic, over the period $t$ to $t + n$. This captures, to a degree, the impact of cohort flows and also is suggestive of momentum effects (see below), but it is a true measure neither of cohort flows nor of momentum. Wong and Carvalho have adopted a not dissimilar technique in their chapter in this book.

A third issue is the measurement of the contribution of momentum to total growth. A literature review suggests that few models exist in this area of analysis. A seemingly unique exception is in the domain of regional population change, where momentum (as against net migration) can be a very important factor. In attempting to disaggregate "ageing in place" from migration, Rogers and Woodward (1988) employed an age-specific variant of traditional component methods. At each age group 5-9 years and over the equivalent of "births" are the "new entrants" to the age group, and the effects of deaths and net migration are then factored out to isolate the pure effects of momentum. They show that, at the state level, "ageing in place" makes a very signifi-

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demiological and morphological ends. His plenary paper in a session on the Demography of China at the *Manila IUSSP Conference*, 1982, was a fascinating exposition of the implications for that society of "morphological" changes.

cant contribution to regional change in the United States, less so in "sunbelt" regions subject to retirement migration inflows, more so in others. This finding is of real significance in terms of planning for ageing.

Any such analyses would need to draw a distinction between gross and net momentum. This is more than merely an academic distinction but has policy implications. Gross momentum is an indicator of the degree of total turbulence in the age-structural transition: it is the sum of the way waves mount and then drop off into troughs. The more turbulent the system, the more complex the policy and planning models necessary to respond to the trends. The net figure also carries policy implications for it provides an approximation of changes due purely to birth-cohort size, in the case of a population "closed" to migration, or the additive effects of birth-cohort sizes and migration effects.

The fourth methodological question relates to projections. A major problem arises from the fact that traditionally a deterministic set of parameters has been posited, typically involving changes in rates up until some future date and then constant rates thereafter.

Recently, to attempt to overcome this weakness, a family of stochastic projection methodologies has been proposed (e.g. see Lutz *et al.* 2001; Tuljapurkar *et al.* 2000). This development has, however, left unsolved several problems. Firstly, stochastic methodologies produce a plethora of trajectories and parameters; selecting the more likely patterns from among these, and certainly avoiding doing so arbitrarily becomes an inherent problem. Secondly, much of the work to date has been directed towards projecting two variables, mortality and fertility. Very little has been done on migration, a very difficult parameter to project for "open" populations. Thirdly, little has been achieved in interrelating these different factors, or on their interactions with covariates. Finally, there is a need to review the implications of these problems for the projecting of age-structural changes. In a sense, an age-structural transition, and its component waves and cohort flows, is a descriptor that synthesises, as it were, the effects of the different population dynamics (fertility, mortality, migration as these affect the age structure existing in a base year). The trajectory of the age-structural transition is determined by these dynamics.

## 5. Structure of the Remainder of this Book

The remaining chapters are largely empirical case studies. The first Part refers to global trends. The next chapter, by Ian Pool, looks at the empirical evidence on different age-structural transitions. Then two others by Bo Malmberg and Thomas Lindh, and by Anne Goujon discuss global trends for two key development factors, GDP and education.

The second Part of the book, subtitled "Anticipating and Managing Waves" consists of case studies for different representative countries. Gervais Beninguissé and Hamidou Koné start with Cameroon, a country that is only beginning its age-structural transition. More advanced on their transitions are Indonesia, looked at here by Sri Moertiningsih Adioetomo, Brazil, presented by Wong and Carvalho, Fiji, in a chapter by Seniloli, and Philippines in the chapter by Gultiano and Xenos. Each of these chapters has a flavour of its own: the Cameroon study has to add in the spectre of HIV/AIDS; the Brazil chapter raises a major question, the occurrence of several different transitions within the one country; in the case of Fiji the particular problems of small island states faced with significant migratory flows is examined; and the Philippines chapter focuses on one determinant and consequence of disordered cohort flows: the migration of youth. Nevertheless, together they question the capacity of countries to respond to bonuses or windows of opportunity.

The last three case studies in Part Three deal with situations where disordered cohort flows are severe, producing "conditions of turbulence". Cornelia Muresan studies Rumania, Yan Hao looks at China, and Amir Mehryar and Shirin Ahmad-Nia analyse trends for Iran.

By their very nature the contents of this book lead inexorably to policy questions. The last chapter is based on a policy paper, drawn from key findings of the seminar on which these proceedings are based, that was submitted to UNFPA so as to inform not only the elaboration of population and development policy for the decade ICPD (International Conference on Population and Development) + 10, but also the formulation and implementation of the United Nations' Millennium Development Goals. The urgency of this issue and the need to mobilise the international community so that all countries, especially the more disadvantaged, can exploit "windows of opportunity", are the key themes in that chapter.

**References**

BLOOM, D, CANNING, D and SEVILLA, J (2003) *The Demographic Dividend: A New Perspective on the Economic Consequences of Population Change*, RAND, Santa Monica, Calif.

CARVALHO, J A M de (1988) "O tamanho do populaçao brasileira e sua distribuiçao etaria: uma visao prospectiva", in *VI Encontro Nacional de Estudos Populacionais*, Olinda/PE Brazil, Vol 1: 37-66.

CARVALHO, J A M de and WONG, L R (1998) "Demographic and Socioeconomic Implications of Rapid Fertility Decline in Brazil: A Window of Opportunity", in Martine, G, Das Gupta, M and Chen, L (eds) *Reproductive Change in India and Brazil*, Oxford, OUP: 208-40.

CHESNAIS, J-C (1990) "Demographic Transition Patterns and Their Impact on Age Structures", *Population and Development Review*, 16(2): 327-54.

COALE, A and HOOVER, E (1958) *Population Growth and Economic Development in Low-Income Countries*, Princeton University Press, Princeton, NJ.

FREJKA, T (1982) "Momentum", in Ross, J (ed.) *International Encyclopaedia of Population*, Free Press, NY, Vol 2: 450-51.

KEYFITZ, N (1968) *Introduction to the Mathematics of Population*, Addison-Wesley, Reading, Mass.

KEYFITZ, N (1971) "On the Momentum of Population Growth", *Demography*, 8: 71-80.

LINDH, T and MALMBERG, B (1999) "Age-Structure Effects and Growth in the OECD, 1950-1990", *Population Economics*, 12(3): 431-50.

LORIAUX, M (1990) "Il sera une fois… la révolution grise. Jeux et enjeux autour d'une profonde mutation sociétale", in Loriaux, M, Remy, D and Vilquin, E (eds) *Populations âgées et révolution grise. Chaire Quetelet 1986*, Institut de Démographie, Université catholique de Louvain, Bruxelles, Ciaco: 3-32.

LUTZ, W, SANDERSON, W, and SCHERBOV, S (2001) "The End of World Population Growth", *Nature*, 412: 543-45.

*New Shorter Oxford English Dictionary,* 2 Vols. Clarendon, Oxford.

POOL, I (1994a) "Problèmes opérationnels de la population et planification du développement : expérience pratique dans le Tiers Monde", in Institut de Démographie UCL, CIDEP, CEPED (eds) *Intégrer Population et Développement. Chaire Quetelet 1990*, Academia/L'Harmattan, Louvain-la-Neuve/Paris: 275-88.

POOL, I (1994b) *The World's Caring Capacity: Population Compositional Aspects*, Independent Commission, Population and Quality of Life, Paris.

POOL, I (2000) "Vers un modèle de la 'transition âge-structurelle' : une conséquence, mais aussi une composante de la transition démographique", Paper, *Conférence de l'Association canadienne-française pour l'avancement des sciences,* Montreal, May.

POOL, I (2003) "Ageing, Population Waves, Disordered Cohorts and Policy", *New Zealand Population Review*, "Special Issue: Population and Social Policy", 29(1): 19-40.

POOL, I (2005) "Age-Structural Transitions and Policy: Towards Frameworks", in Tuljapurkar, S, Pool, I and Prachuabmoh, V (eds) *Riding the Age Waves. Vol. I: Population Resources and Development*, IUSSP, International Studies in Population, Dordrecht, Springer: 13-40.

POOL, I (under editorial review) "Age-Structural Transitions in Industrialised Countries", Paper IUSSP/Nihon University Population Research Institute, "Age-Structural Transitions in Industrialised Countries: Challenges and Responses", Tokyo, March 2001, in Ogawa, N and Tuljapurkar, S (eds) *Riding the Age Waves. Vol. III: Industrialised Countries*, Dordrecht, Springer.

POOL, I and SCEATS, J (2003) "Low Fertility of the English-Speaking Countries", Paper International Workshop/Seminar on Low Fertility and Family Policies, Tokyo, Nov 2002 (*http://www.ipss.go.jp/English/WebJournal.files/WebPopulation.html*).

PRESSAT, R (1978) *Statistical Demography*, Methuen, London.

ROGERS, A and WOODWARD, J (1988) "The Sources of Regional Elderly Population Growth", *Professional Geographer*, 40: 450-59.

ROWLAND, D (1996) "Population Momentum as a Measure of Ageing", *European Journal of Population*, 12: 41-61.

RYDER, N (1965) "The Cohort as a Concept in the Study of Social Change", *American Sociological Review*, 30: 843-61.

SHRYOCK, H, SIEGEL, J, and Associates (1976) *The Methods and Materials of Demography*, Academic Press, NY.

STERN, C and TUIRÁN, R (1993) "Transición Demográfica y Desigualdad Social en México", in *IV Conferencia Latinoamericana de Población*, Mexico City, INEGI/UNAM/PROLAP, 1(2): 970-1015.

TULJAPURKAR, S, LI, N and BOE, C (2000) "A Universal Pattern of Mortality in the G-7 Countries", *Nature*, 405: 789-92.

UNITED NATIONS (1967) *Manual IV: Methods of Estimating Basic Demographic Measures from Incomplete Data*, UN Population Division, NY.

UNFPA (United Nations Population Fund) (1989) *Comparative Evaluation of UNFPA Support to Population and Development Planning: Global Report*, UNFPA, NY.

WONG, L R, CARVALHO, J A M de and AGUIRRE, A (2000) "Duración de la Transición Demográfica en América Latina y su Relación con el Desarrollo Humano", *Estudios Demográficos y Urbanos*, El Colégio de México, Mexico City, 43: 185-208.

WONGBOONSIM, K (2004) "The Demographic Dividend and M-Curve Labour Force Participation in Thailand", *Applied Population and Policy*, 1(2): 115-22.

# 2

# MAPPING AGE-STRUCTURAL TRANSITIONS: A COMPARATIVE PERSPECTIVE

**Ian POOL**[1]

***Abstract***

This chapter provides empirical data on regions and case-study countries at different stages of demographic and age-structural transition. It covers both the longer term, out several decades, and the shorter period to 2015 spanned by the United Nations Millennium Development Goals. The policy implications of age-structural transitions are discussed and their interrelations with other population transition models identified.

## 1. Some General Questions

This chapter is empirical and descriptive. It picks up some of the more theoretical points raised last chapter and presents data on different patterns and trends identified there. Above all it takes a range of case-study countries at different phases of age-structural transition, and maps their characteristics.

The aim is to promote both a longer-term and short-term perspective. Thus, it does this firstly by looking at longer-term trends (Figures

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1 and 2). Then it compares the 15-year period leading up to the year 2000 with the next 15 years (Figure 3, Tables 1-3 and Appendix Tables 1 and 2).

It thus provides a background to Chapters Three and Four which are also both global in focus. Together these three chapters examine the broader context for the chapters in the next two parts of the book in which country, and in one case sectoral, case studies are presented.

## 2. Age-Structural Transitions: The Longer Term

To illustrate the discussion in Chapter One, in Figures 1 and 2 data are presented on a number of case-study countries. Some of the countries chosen and some of the comments here are drawn in the main from an earlier paper (Pool 2005; source data United Nations series, 2000 Revision), but three more African countries, Kenya, Nigeria and South Africa, plus Brazil in Latin America, have been added here in this paper.

Figure 1 uses conventional percentage age distributions. Childhood is represented here by age group 0-14 years; youth by 15-29 years; early middle age by 30-44 years; late middle age by 45-59 years; early retirement age by 60-74 years; and old age by 75+ years. Figure 2 then standardises the impacts of waves and cohort flows on different life-cycle stages by relating each change back to the base population (all ages) at the start of each quinquennium.[2] In both sets of figures the graphs relate to functional age groups, that are proxies for life-cycle stages, that in turn are seen as being characterised by distinct sets of social and economic needs, and behaviours. Needs and demands will relate to both the public and private sectors, and behaviours can be social, economic, cultural and consumer in form. Of course, the distinction between needs and demands is often very difficult to draw. Even the so-called "basic needs" can have a discretionary element. Housing is a very good example of this, as shelter is a basic need, yet for the majority of the world's families probably takes the form of demands met by the market or the wider family.

2. A more direct indicator (the contribution of changes at each age group, negative or positive to total change over any quinquennium) encounters arithmetic problems with some countries undergoing negative total growth, and produces grossly distorted figures in those countries with very slow positive growth.

Some life-cycle stages, such as youth, are subject to high level of "demographic density" (to use the phrase of Rindfuss 1991); that is, they constitute periods in the life span in which a range of different bio-social events are acted out. In the youth years, for example, a number of key reference points are reached or passed, some of which involve lifetime statuses (e.g. completion of highest educational qualification). One can identify as examples the following:

(a) biological maturation is attained;
(b) typically, formal education is completed and first entry to the labour market occurs;
(c) these are ages at which the incidence and prevalence of geographic mobility are likely to be highest;
(d) social maturity is also reached, the young leave their families of origin and their parents become "empty-nesters" (or at least they used to – this is changing in some developed countries with the phenomena of "boomerang kids" and "cluttered nests");
(e) and, normally, entry into a first union will take place, and, frequently, young people will also be forming their own families of reproduction.

A similar list built around increasing frailty, retirement, material dependency and grand-parenting could be constructed, for example, for age groups 60-74 years. At other life-cycle stages densities and *rites de passage* may be less intense, but each has its own set of changes.

In Figures 1a, 1b, 2a and 2b results for the world and two slow-growth countries are graphed. The "world" averages out all the different models, and as a result, at least by comparison with a country like Russia, the globe as a whole appears to be subject to a relatively unturbulent progression through its age-structural transition (see especially Figure 2a). That said, a modest surge had occurred at the youth ages around the time of the Cairo ICPD, and this age group will be the second most important for decades to come. This last comment underlines the point that the "window of opportunity" is not just about a gross reduction in dependency as the world's population shifts from a youthful to a more elderly structure, but the passage through a phase during which the per cent at working ages is higher. But it also points to the fact that the labour force itself can go through more localised age-structural transitions that change the distribution within the working ages. While juvenation of the labour force is often seen as desir-

able, as a sort of side product of the demographic dividend because it brings in workers with newly acquired skills, there may also be an obverse side to this that has implications for fiscal policy. That is, if labour supply is to become human capital, investments in the labour-force entrants will be necessary, and these may compete with the need for increased savings for the long-term impacts of ageing.

### *2.1. Countries That Are at Advanced Stages of Age-Structural Transition*

The Russian Federation and France represent two slow-growth populations (Figures 1a, 2a and 2b) and for Russia change was negative over the period 1990-1995 (-0.02%; but +0.05% for France). Yet the case of the Russian Federation shows that slow growth is not the end-point for population "problems" and that these constitute far more than ageing. The perturbed nature of the Russia age pyramid comes not from the passage through it of one wave, but of a number representing different cohorts that sequentially and irregularly affect different life-cycle stages. These stages may also be affected more than once by different birth cohorts (see especially Russia in Figure 2a).

In both graphs France contrasts markedly with Russia (cf. Figures 2a and 2b). Whether by lucky accident or by design through policy interventions, France has in front of it a remarkably "calm" age-structural future. Its trajectory has positive implications for policy development as shifts are gradual and of limited volume. That said, and as is true for numerous other developed countries, France may well see rapid inflows of migrants that could distort its age structure.

Parenthetically, it is worth noting that across slow-growth countries, not just Western developed countries, migration has been posited as a response to ageing, and advocacy for this will most likely arise when troughs occur at key working ages. In a major recent study the United Nations (2000) has addressed this phenomenon, noting the fact that the inflows would have to be very large. It is clear that these might be beyond what would be acceptable politically, particularly where cultural factors are concerned (e.g. for Japan, Teitelbaum 2003). The demographic and social impacts of migration on the countries of origin are oft-ignored questions, the significance of which must also be recognised (see Gultiano and Xenos in this volume: a case study of a

sending country). But as Dittgen adds, there is yet another dimension to this: immigration will be advocated

> "not for demographic imperatives but for economic [needs] and these will fluctuate… These [migratory] movements will only serve to accentuate the chaotic trends in the age pyramids" (Dittgen 2002: *passim*; my translation).

The United States is the third "slow-growth" case-study population nearing the end of stage two of its age-structural transition or entering the third. In terms of proportions by functional age group (Figure 1b), it bridges between European countries and developing countries; in terms of the impacts of cohort flows in Figure 2b the United States fits somewhere between France and the Russian Federation. But these are attributes it shares with the other English-speaking neo-Europes, North America and Australasia, especially New Zealand. All four of these countries are, of course, immigrant receiving populations, and these streams have a significant impact on population growth and size as well as age and ethnic structures. It is worth stressing that this holds true even in Australasia, where most of the inflows are of documented migrants. In New Zealand, for example, 14% of the entire population in 2001 comprised documented immigrants or their children from the Pacific and Asia, alone, and there were others coming from other source countries.

The United States and Russian examples also demonstrate another point: the fact that several cohorts may be bringing pressures on resources and services simultaneously. If one takes the period 2000-2005, two life-cycle stages, young adults and the pre-retirement ages (45-59 years) that have totally different needs and behaviours, are both affected by inflated cohorts. Having geared up policy interventions and markets to cater for the passage of these two cohorts, these initiatives will have to be ratcheted back to cater for lessened needs of deflated cohorts reaching the same ages. At the same time the focus for policy and for markets will have had to shift to the needs of generations at childhood, early adult ages (30-44 years) and early retirees.

The Russian Federation, France and the United States are at different subphases of the ageing stage of an age-structural transition. I now turn to countries that are less advanced in their age-structural transitions: Mexico, Brazil (Figures 1b, 2d, 2e), China, India, Thailand (Figures 1c, 2c and 2d), Kenya and South Africa (Figures 1d, 2e, 2f).

Figure 1
Percentage age distribution, functional ages, 1970-2030

Figure 1a

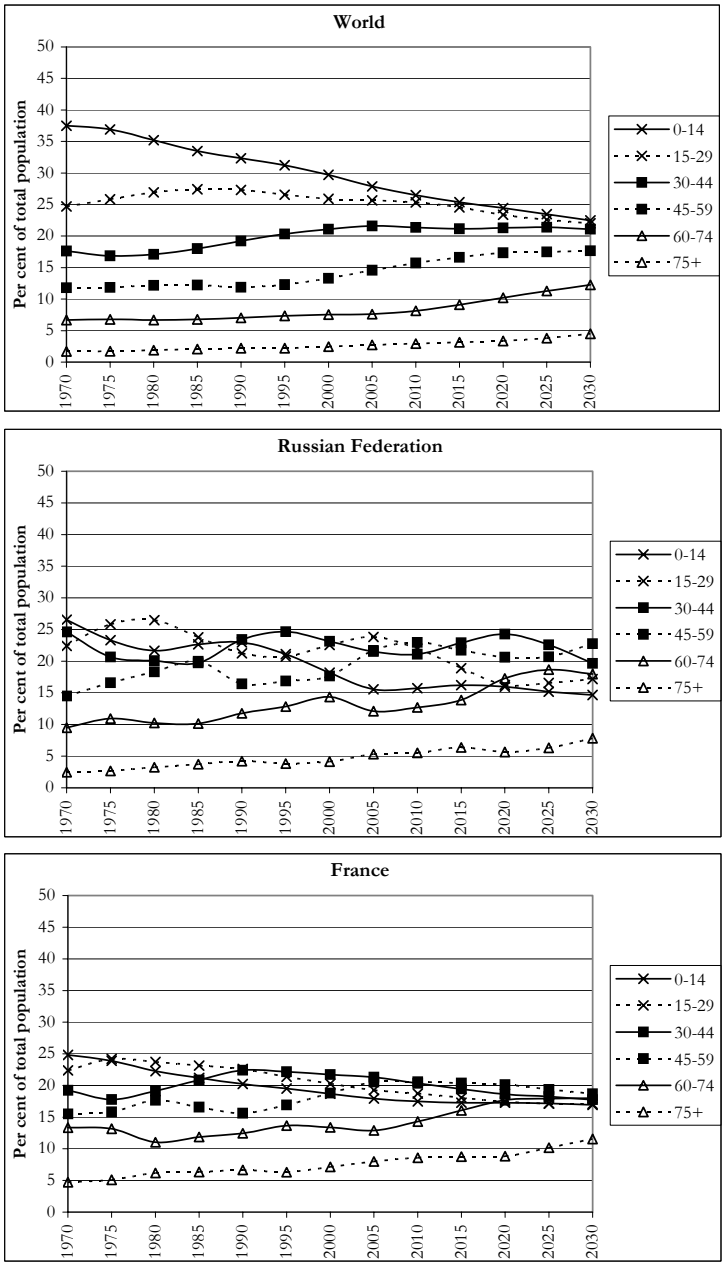


Figure 1b

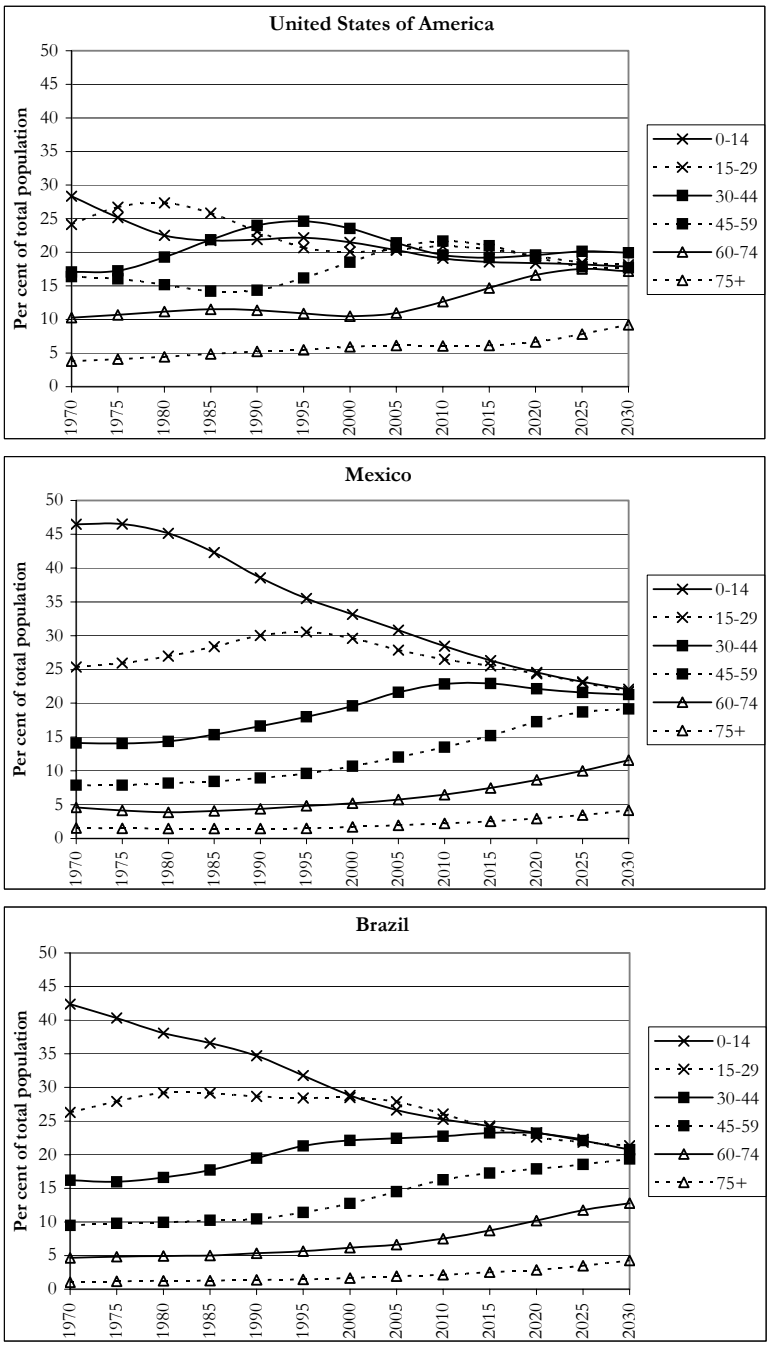

United States of America
Mexico
Brazil
Per cent of total population
0-14
15-29
30-44
45-59
60-74
75+
0
5
10
15
20
25
30
35
40
45
50
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030

Figure 1c

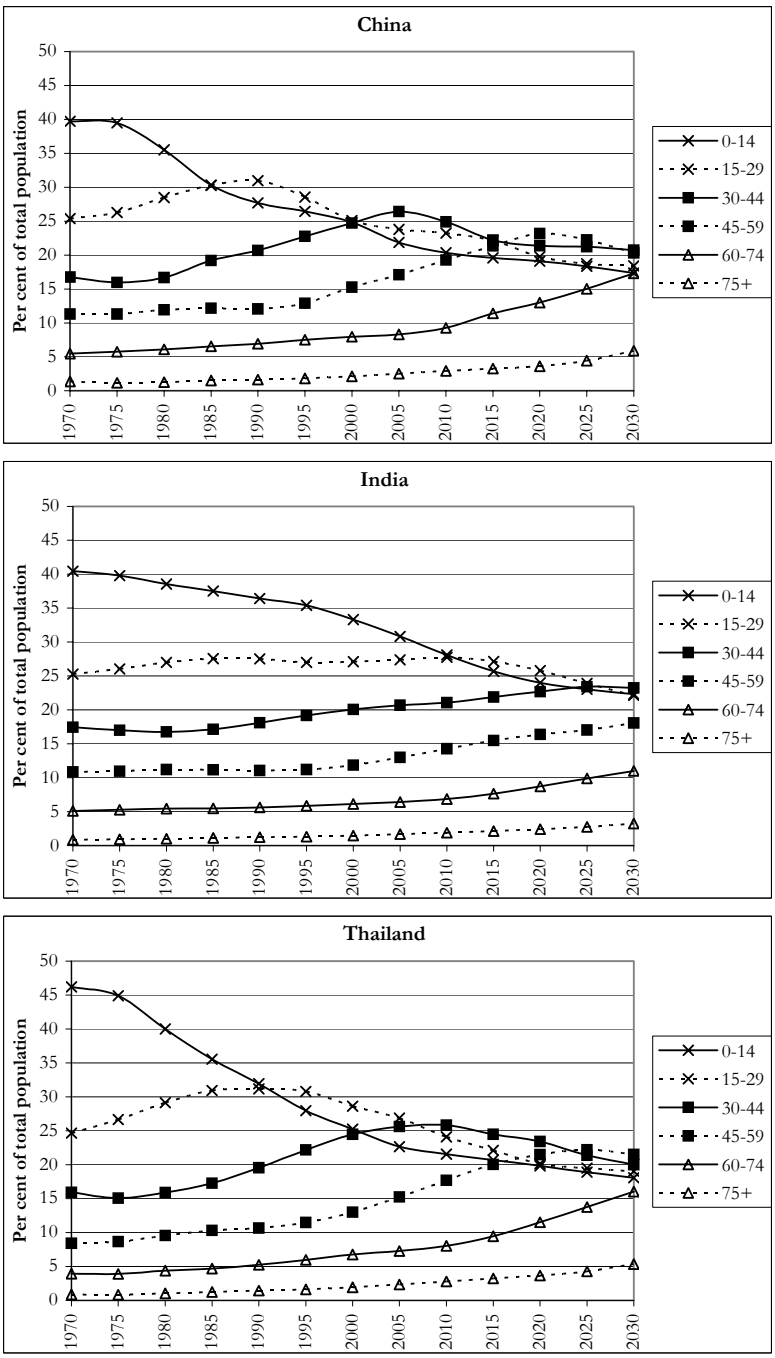

China
India
Thailand
Per cent of total population
0
5
10
15
20
25
30
35
40
45
50
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
0-14
15-29
30-44
45-59
60-74
75+

Figure 1d

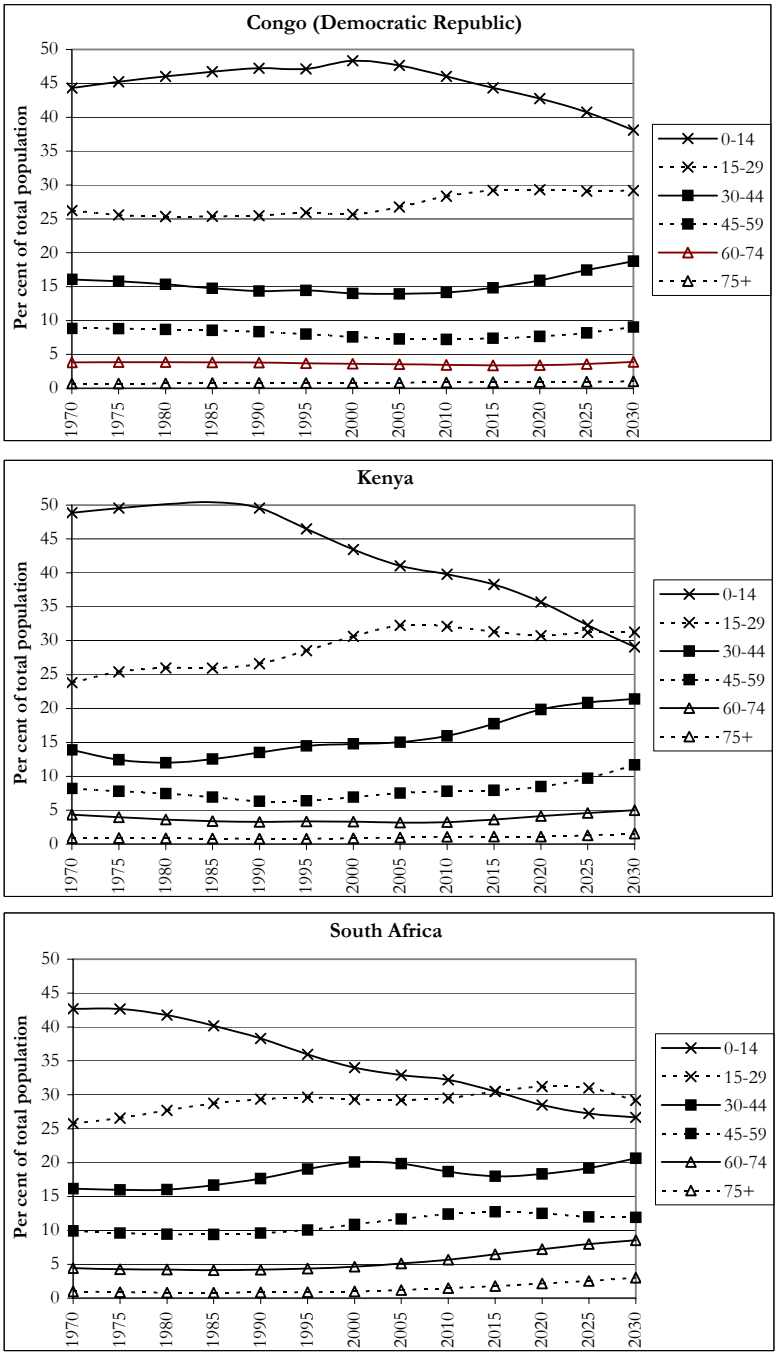
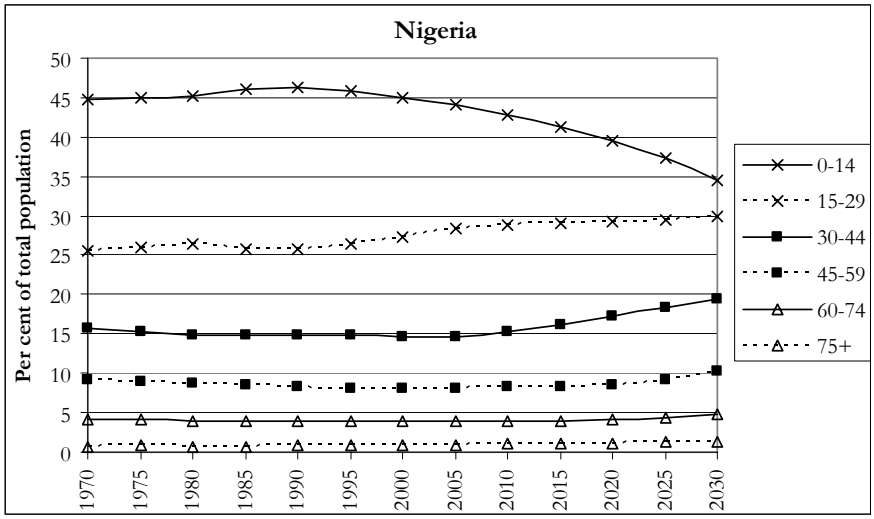

Congo (Democratic Republic)
Kenya
South Africa
Per cent of total population
0-14
15-29
30-44
45-59
60-74
75+
0
5
10
15
20
25
30
35
40
45
50
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030

Figure 1e




### *2.2. Countries That Are at Intermediate Stages of Age-Structural Transition*

The next seven countries are representative of the majority of populations across the world, and thus their patterns cluster around those for the world as a whole (discussed above). That said, they also differ markedly between themselves both in terms of proportions at different life-cycle stages, and the degree to which they are subject to one or multiple waves, and disordered cohort flows. But they share in common a relatively recent starting point for their transitions, at which juncture more than 40% of the population was aged less than 15 years.

India stands out as the member of this group with the most gradual and least disordered transition to date and into the future (Figures 1c and 2c). South Africa falls somewhere between India and the next group: a bit more accelerated than India, and a little more disordered, but not notably so (Figures 1d and 2e). The comments about South Africa, of course, must be tempered, as a very large question mark hangs over this country because of HIV/AIDS. Its age-specific incidence of infection, if carried over to mortality, will have major impacts on survivorship patterns at adult ages, and perhaps also at childhood.

In this seven-country group, the most rapid changes come in the two Latin American examples, for Thailand (Figures 1c and 2d), and for Kenya, although it has only recently started its transition (Figures 1d and 2f). These countries vary, however, in terms of the effects of waves on life-cycle stages. Thailand, and to a lesser degree Mexico, and the even more muted case of Brazil, show the effects of the passage of one wave as it progresses from life-cycle stage to the next, although Thailand has multiple wave effects, but of limited significance (Figures 2d and 2e).

Of all the case studies, it is Kenya that starts from the highest point with over 50% of its population under 15 years at the outset (Figure 1d). Parenthetically, the reasons for the slight rise for it, and for Congo and Nigeria, to be dealt with below, have been explained by Dyson and Murphy (1985) – a modest increase in fertility from high to very high as a prelude to the "onset of fertility decline" – and are not an artefact of poor data.

Turning to the effects of cohort flows on Kenya's structures (Figure 2f), this case study is remarkable for the velocity with which waves move from one life-cycle stage to another. It also has multiple waves passing through key life-cycle stages, undoubtedly due to secondary momentum, to an echo effect as large birth cohorts become inflated parenting cohorts and produce larger birth cohorts, even though their fertility rates will fall below those of their parents. Kenya's case, by comparison to India's, is a reminder, then, that a very rapid decline in fertility will produce some degree of disordering, particularly in societies with a young average age at marriage. Very large birth cohorts are suddenly followed by much smaller ones, but, as just noted, despite fertility declines they may go on to produce larger cohorts, all over a very short time frame. The last section of this paper returns to the implications of this for medium-term policy analyses. Again the spectre of HIV/AIDS hangs over this country and could significantly change the path just outlined.

Finally in the intermediate group comes China, the most complex and disordered. It starts off from a high point in 1970, but not from an exceptionally high one. The changes in Figure 1c appear reasonable, but when one turns to the graph on China in Figure 2c the perturbations coming from disordered cohort flows become evident.

These case studies show, with the possible exception of India, that even with relatively well ordered fertility declines, as seems to have

Figure 2 — Impact of cohort flows on functional age groups, 1970-2030

Figure 2a

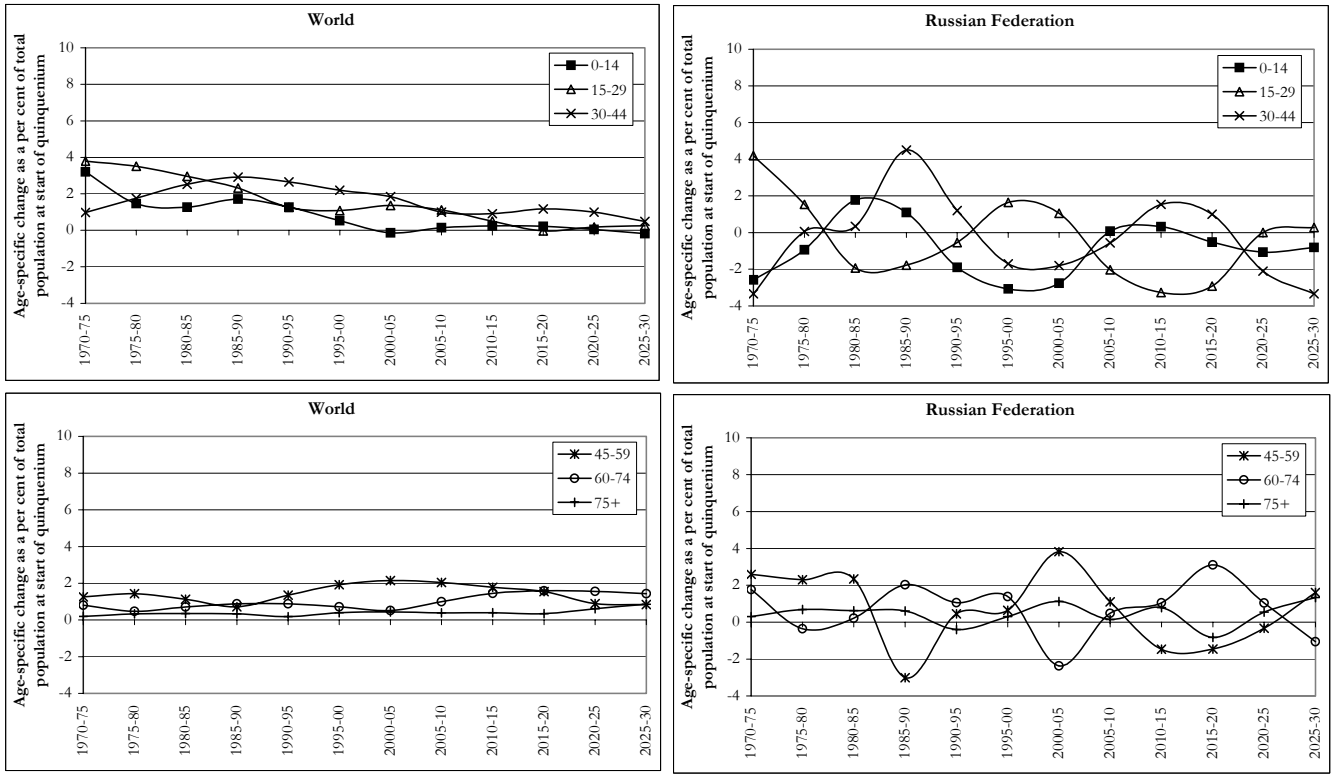


Figure 2b

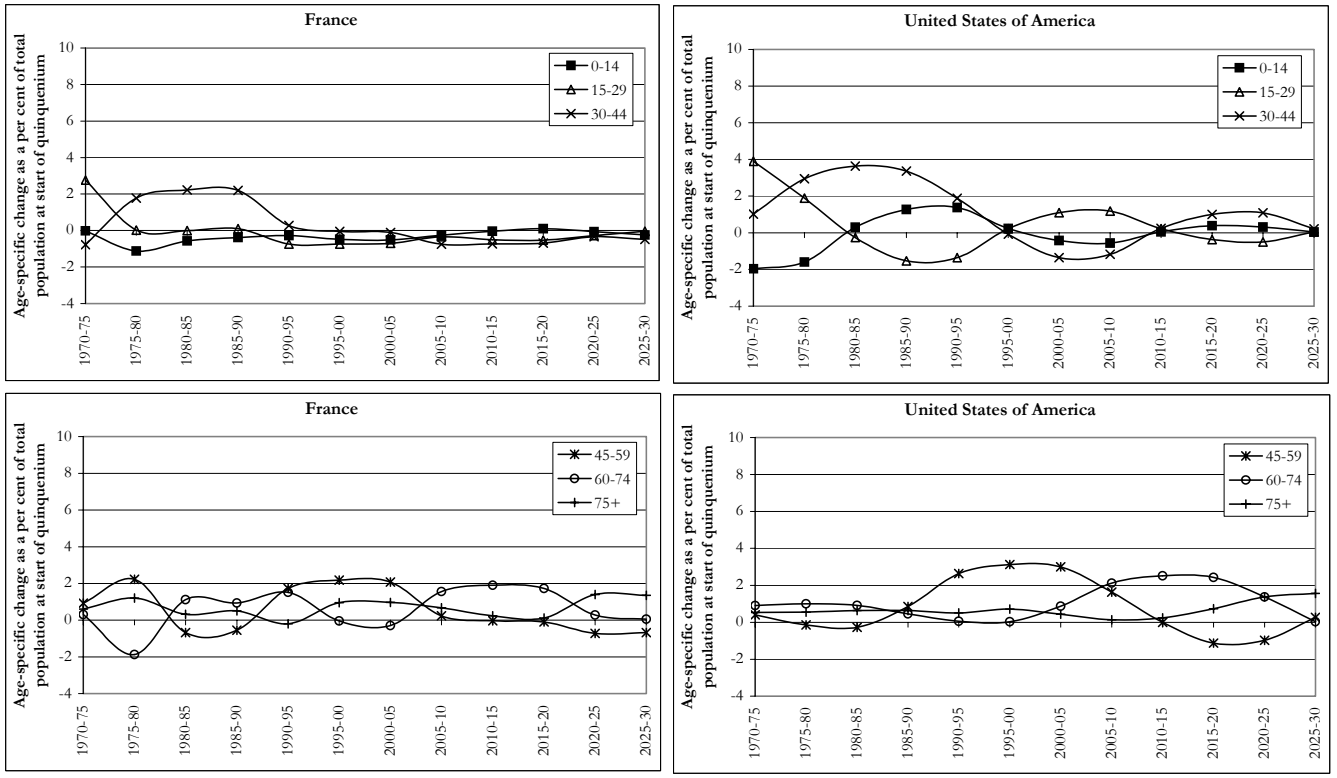

France
United States of America
Age-specific change as a per cent of total population at start of quinquenium
0-14
15-29
30-44
45-59
60-74
75+
10
8
6
4
2
0
-2
-4
1970-75
1975-80
1980-85
1985-90
1990-95
1995-00
2000-05
2005-10
2010-15
2015-20
2020-25
2025-30

Figure 2c

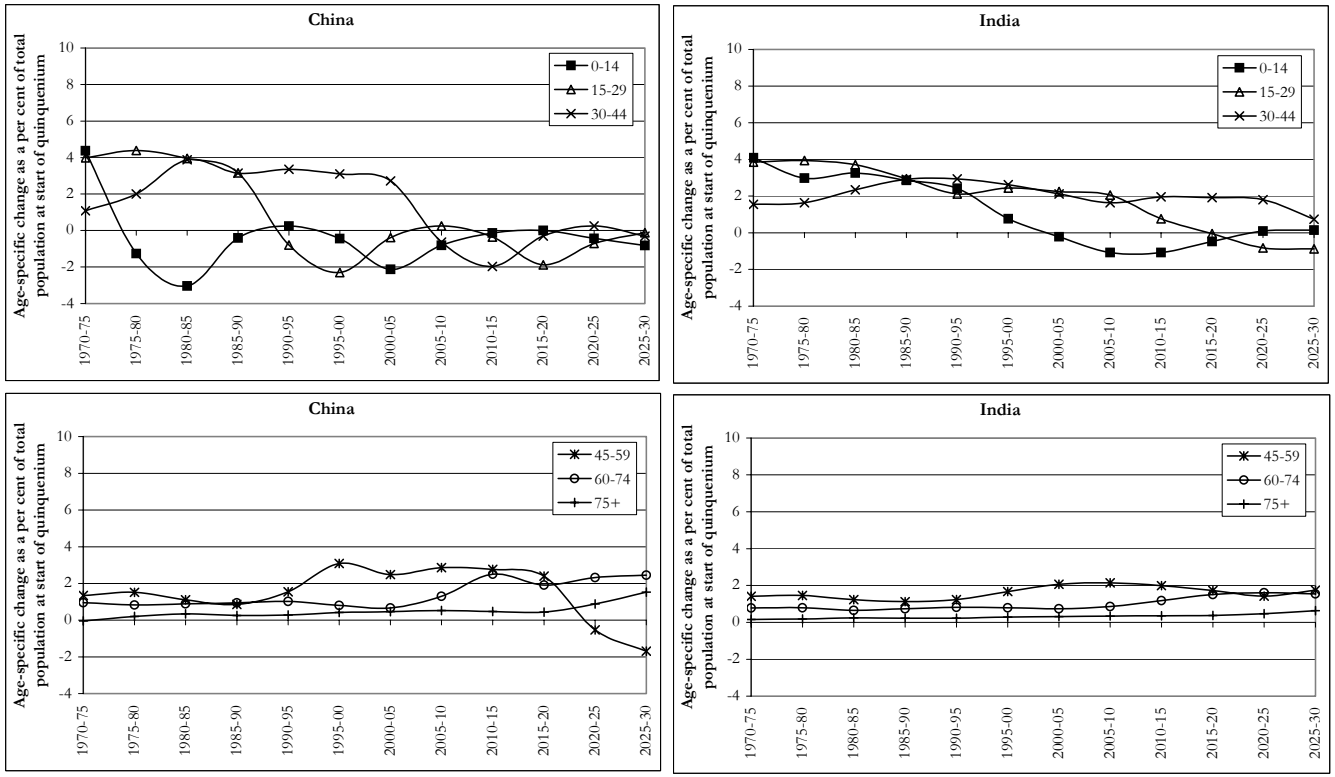
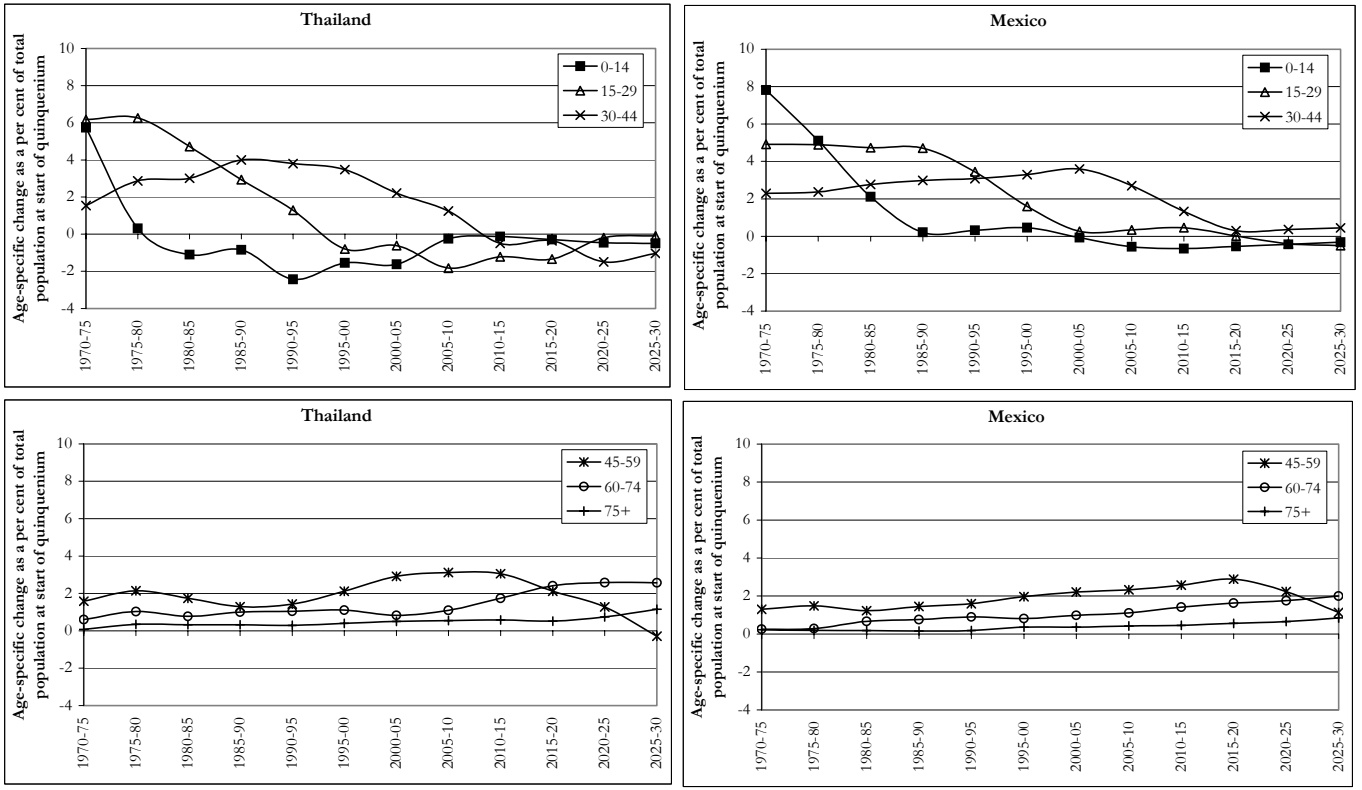

China
India
Age-specific change as a per cent of total population at start of quinquenium
0-14
15-29
30-44
45-59
60-74
75+
10
8
6
4
2
0
-2
-4
1970-75
1975-80
1980-85
1985-90
1990-95
1995-00
2000-05
2005-10
2010-15
2015-20
2020-25
2025-30

Figure 2d


Thailand
Mexico
Thailand
Mexico
Age-specific change as a per cent of total population at start of quinquenium
0-14
15-29
30-44
45-59
60-74
75+
10
8
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4
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0
-2
-4
1970-75
1975-80
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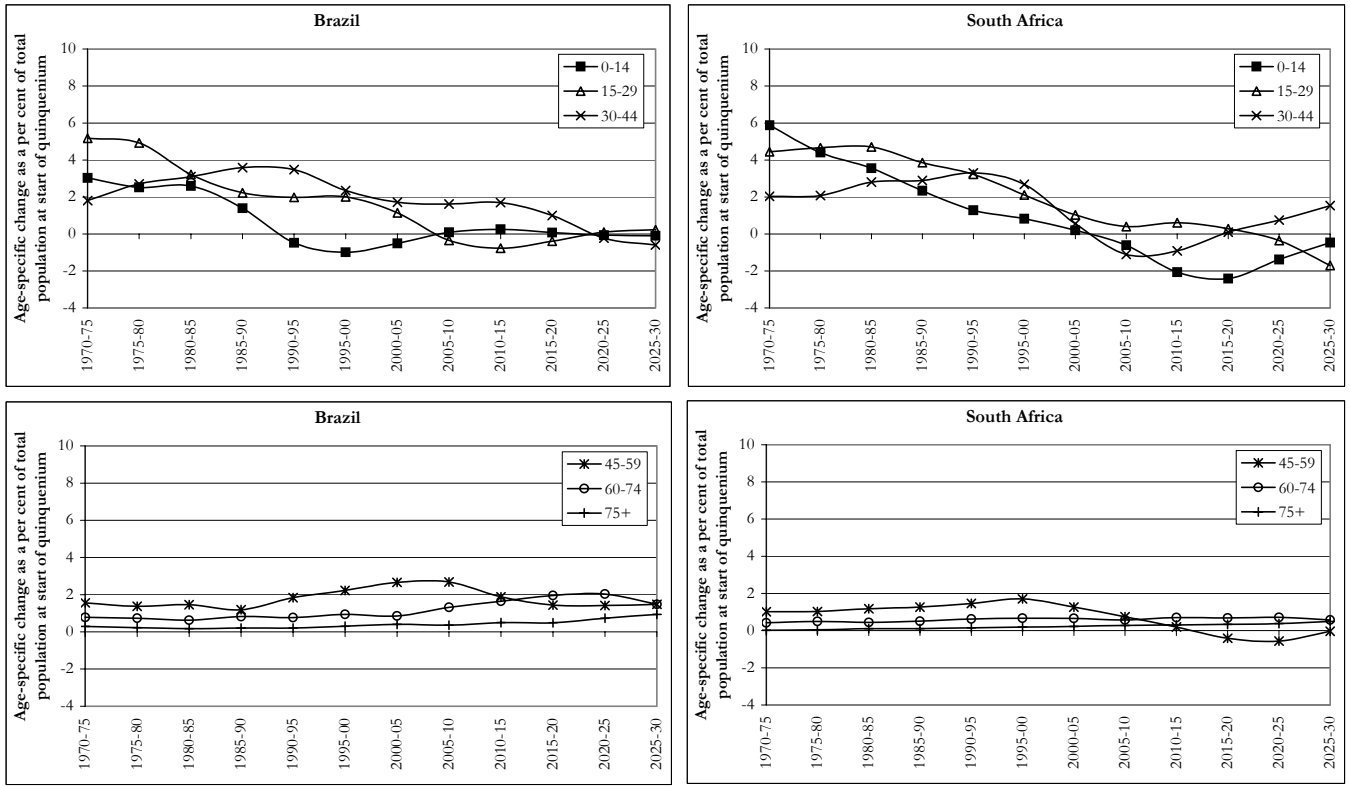
2005-10
2010-15
2015-20
2020-25
2025-30

Figure 2e


Brazil
South Africa
Brazil
South Africa
Age-specific change as a per cent of total population at start of quinquenium
0-14
15-29
30-44
45-59
60-74
75+
10
8
6
4
2
0
-2
-4
1970-75
1975-80
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1985-90
1990-95
1995-00
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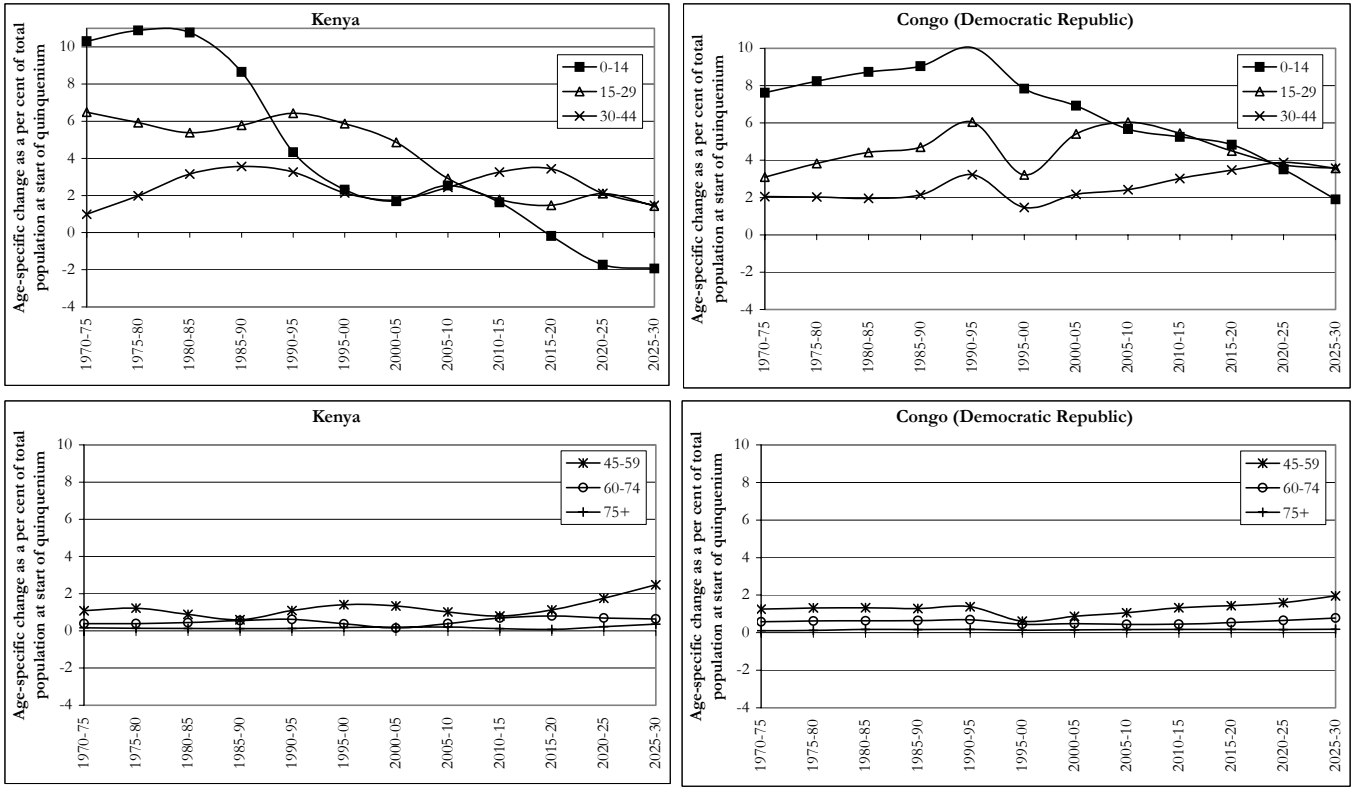
2005-10
2010-15
2015-20
2020-25
2025-30

Figure 2f


Kenya
Congo (Democratic Republic)
Kenya
Congo (Democratic Republic)
Age-specific change as a per cent of total population at start of quinquenium
0-14
15-29
30-44
45-59
60-74
75+
10
8
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0
-2
-4
1970-75
1975-80
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1985-90
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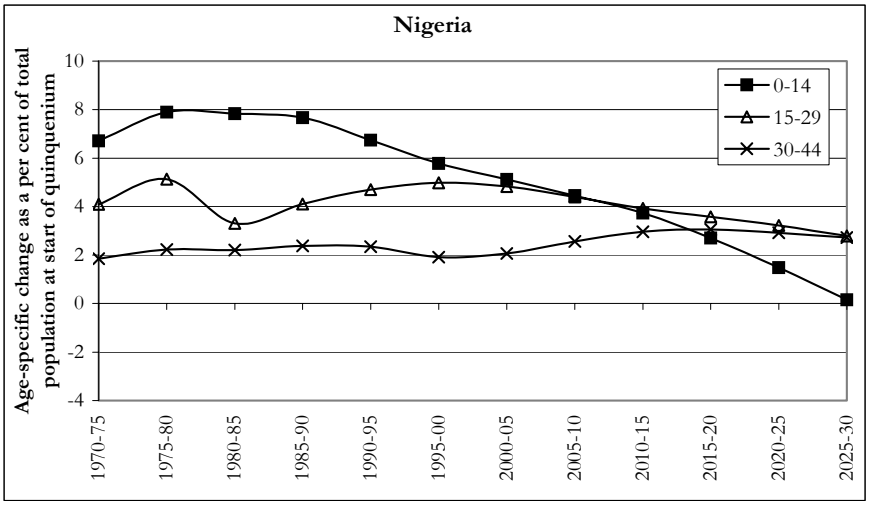
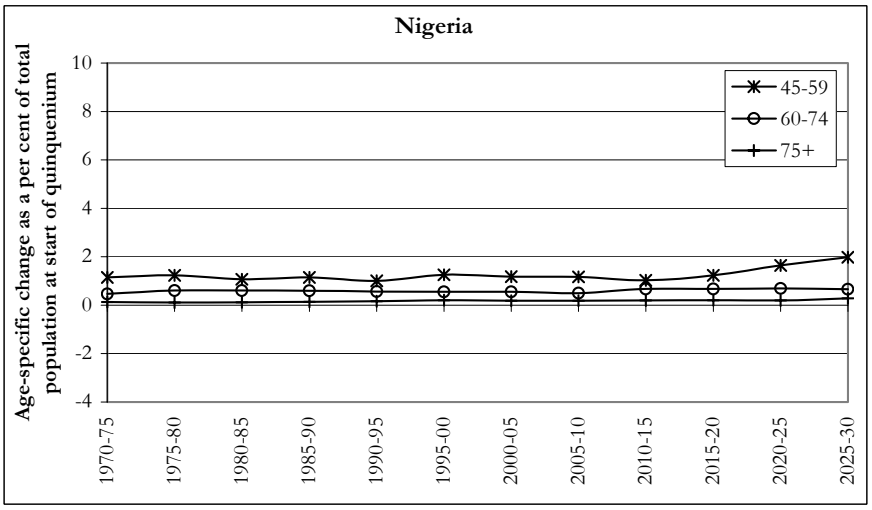
2010-15
2015-20
2020-25
2025-30

Figure 2g




been the case in Latin America or Thailand, the states concerned will be faced with rapid shifts in the distributions across life-cycle stages. In some cases, this will come from the passage of only one wave; in other cases because of multiple waves.

These countries very definitely fit the "demographic bonus/ windows of opportunity" models. That said, the wave effects shown here will often put great strains on the resources and investments required if the states concerned are to exploit these bonuses. A corollary

of this is that, until the end of the projection period used here, the major changes and pressures will come at the childhood, youth and early adult ages, not at ages above these. This point will be picked up in the next section of the paper.

### *2.3. Countries That Are at an Early Stage of Age-Structural Transition*

Data from the remaining two countries, Congo and Nigeria, are graphed in Figures 1d and 1e, and 2f and 2g. Looking at proportions at key life-cycle stages, they start from, and still have, very high percentages at childhood. It can be assumed that they will follow the trajectory shown by Kenya, and perhaps Mexico, but once again the possible effects of HIV/AIDS makes forecasting difficult. In this case the rapid but relatively smooth transitions they show to date will continue, but perhaps mediated because of the caveat relating to secondary momentum effects (defined Chapter One) already suggested for Kenya.

## 3. Age-Structural Change over the Next Decade and a Half

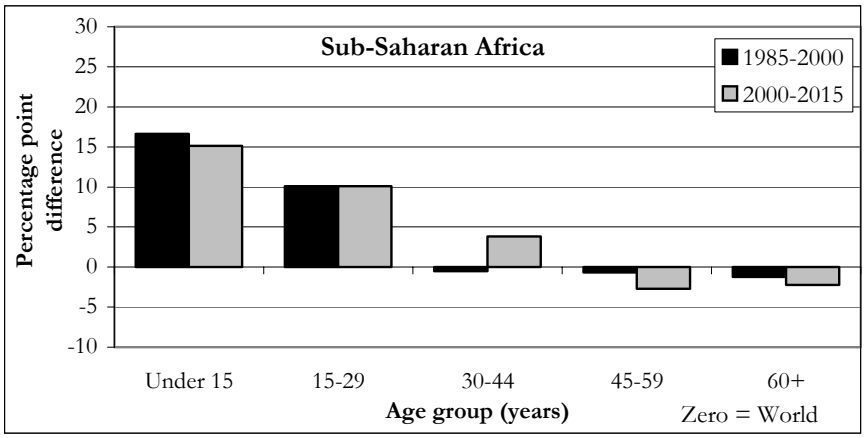
The perturbations created by population waves are not just phenomena that will unfold over the long term, but they will have an impact in the immediate future. To illustrate this very important point age-structural changes for major age groups representing life-cycle phases are graphed in Figure 3 for two periods, the recent past (1985-2000) and the near future (2000-2015). These graphs show how the case-study populations deviate from world's patterns. The graphs refer to selected case-study regions (UN classification) and countries (see detailed data: Appendix Tables 1 and 2).

The period over the next 15 years, shown in the graphs in Figure 3, is going to be structurally turbulent, especially for many Third World populations. Thus, they will face waves passing through key life-cycle stages, often with marked ebbs, over very short periods.

Most marked in some ways, at least in terms of deviations from world patterns, is sub-Saharan Africa, and two of its giant nation-states, Nigeria and the Democratic Republic of Congo, that are even more extreme. High levels of deviation from global patterns indicate that, relatively, pressures on policymakers for strategies affecting 0-29-year-

Figure 3
Percentage-point deviation between global age-structural changes (= zero), and selected regional and country patterns, 1985-2000 and 2000-2015

Figure 3a
World regions



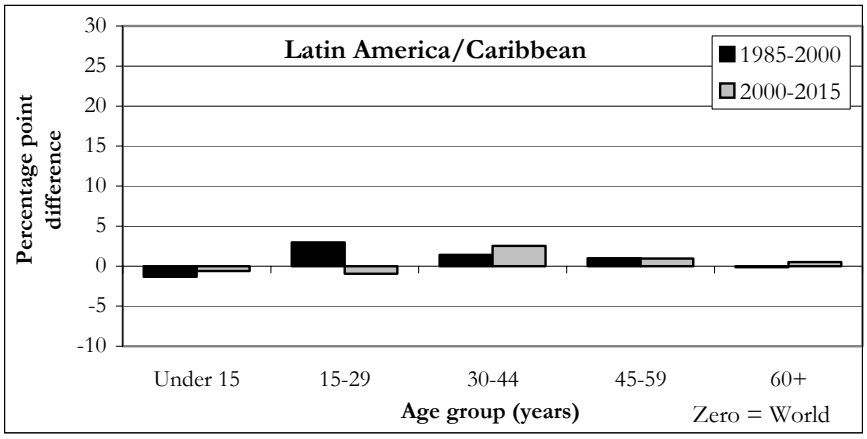



Figure 3b
World regions

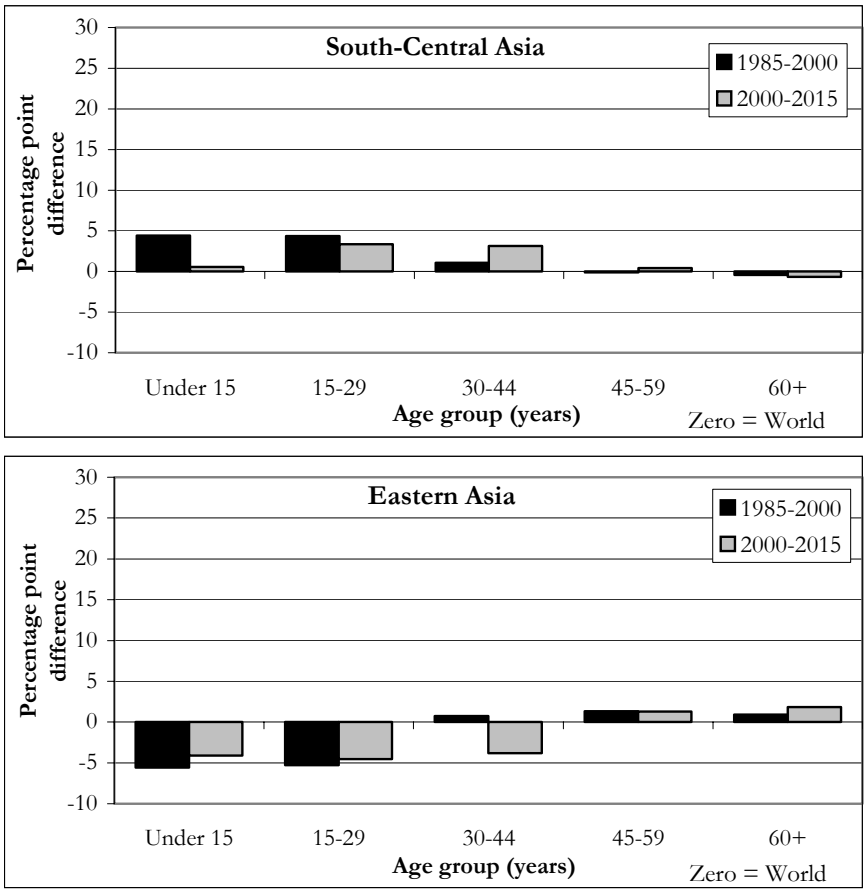


Figure 3c – Case-study countries

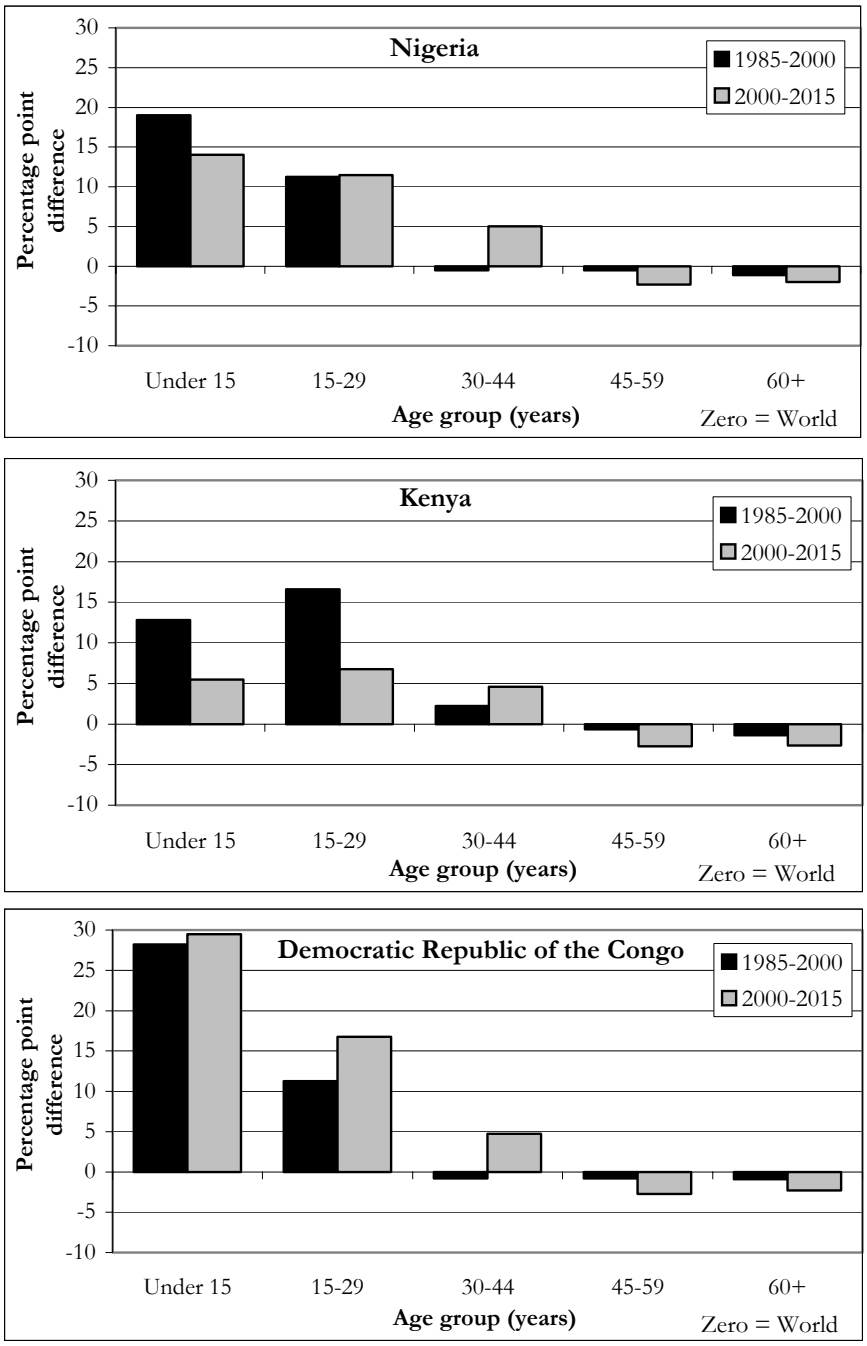


Figure 3d – Case-study countries

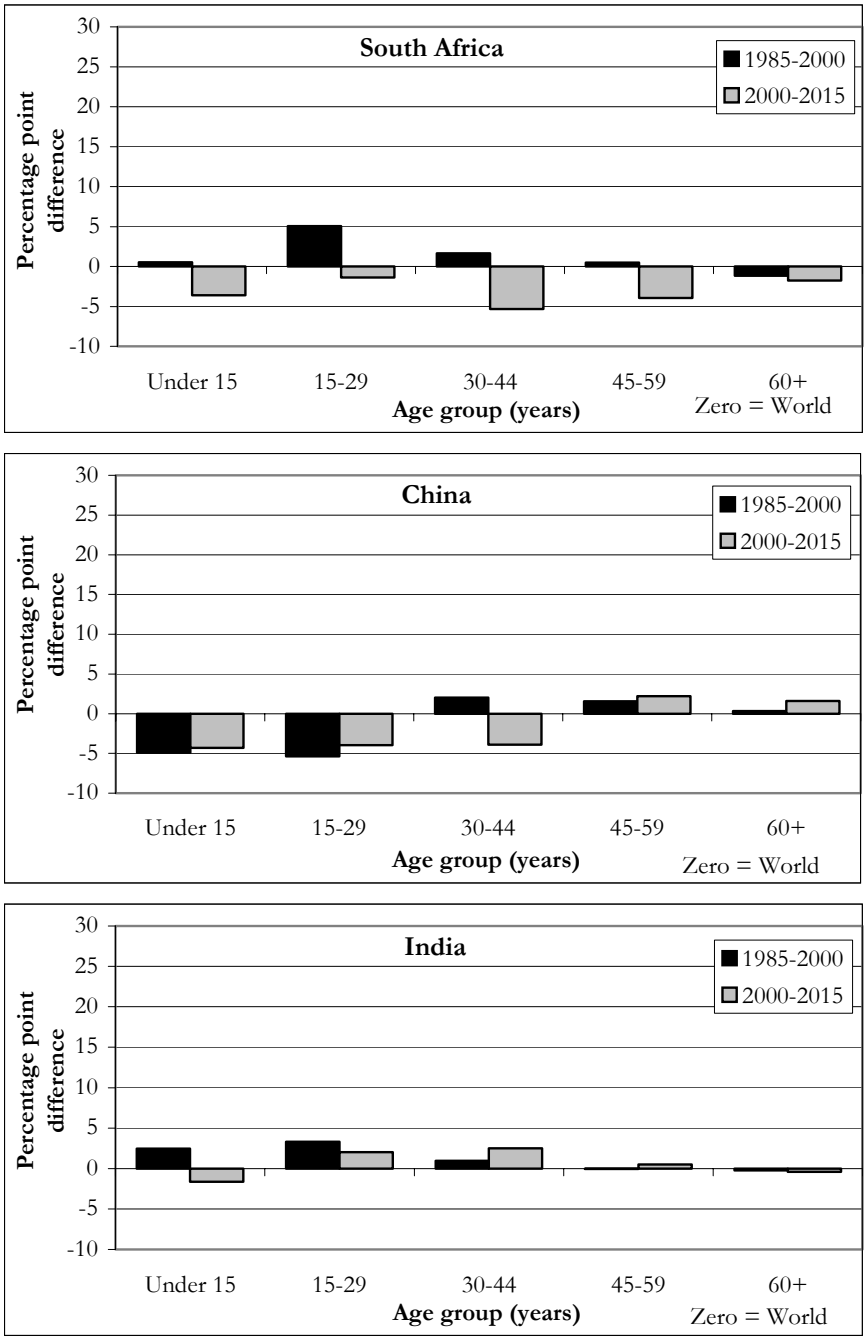


Figure 3e – Case-study countries

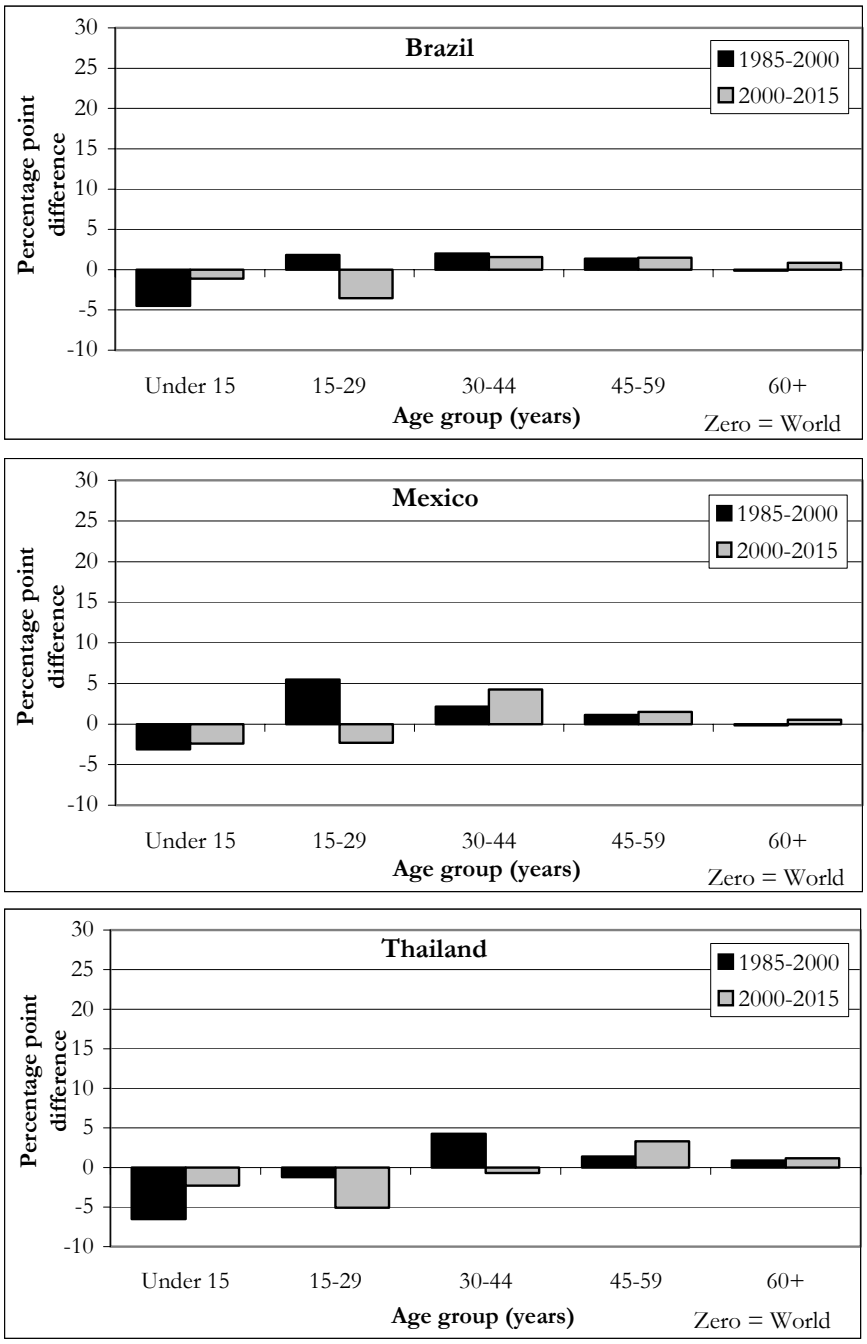
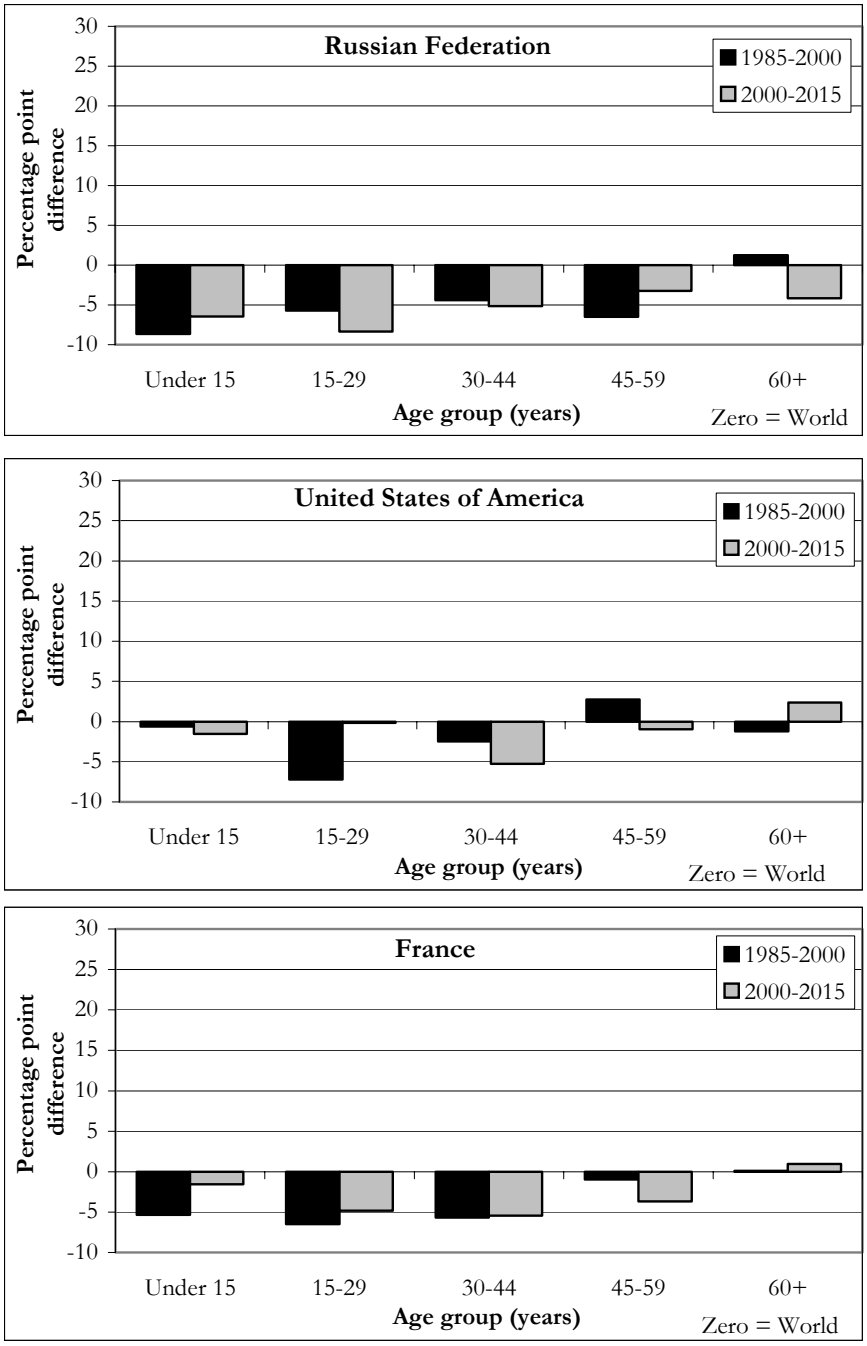


Figure 3f – Case-study countries



olds will be extremely marked, but will also have shifted to 30-44 years over the period 2000-2015. This is a "tidal-wave" effect coming largely from simple momentum, especially for Nigeria and the Congo.

Not all African countries fit this pattern. South Africa and, even more so, Kenya have patterns that look more like those of South Asia which, to a significant degree, reflects what happens in India. In all these three cases relative pressures shift from the child ages (0-14 years), remain strong at the youth ages (15-29), but also shift up into age group 30-44 years.

Latin America and the Caribbean will have moved further along this path. Relative to the world as a whole pressures will be less at childhood, will decline and become less at 15-29 years, but will increase at 30-44 years, and start to appear at older ages. Mexico and Brazil are more extreme versions of this pattern producing, in the case of Mexico, marked waves. Thailand from outside this region is an even more extreme version of the pattern also seen in Mexico and in Latin America and the Caribbean.

East Asia is dominated of course by China. There, the declines in pressure at 0-14 are particularly strong. By 2000-2015, pressures will accelerate at 45+ years.

The three developed countries (France, the United States and the Russian Federation) resemble each other to a degree. But the Russian Federation is notable for the waves and ebbs in adjacent 15-year age groups, a very destabilised pattern.

To elaborate on this, in Table 1 data are presented on the world's age structure and its transition to 2015. It must be stressed that the age groups vary in length; the new entrant group (here represented by 15-24 years) is the smallest. Two key age groups for labour supply and human capital, 15-24 and 25-44 years comprise virtually the same proportion of the total over the 20 years from 1995 to 2015. This is strong evidence at a global level of the bonus/windows of opportunity effects. But the profile either side of these ages goes through more significant changes, with late middle and retirement ages gaining at the expense of childhood ones. Yet throughout the period, age group 0-4 (not shown on the table) remains the largest single quinquennial age group, and aged/child ratios (age group 65+/age group 0-14) remain low.

There are, however, significant differences in numerical and percentage increases by age, and in age-specific contributions to overall change. This is illustrated here by Appendix Tables 1 and 2.

Table 1
Per cent of total population at selected age groups*.
The world, 1995, 2000, 2015

| | 0-14 | 15-24 | 25-44 | 45-64 | 65+ | Total |
|---|---|---|---|---|---|---|
| 1995** | 32 | 18 | 29 | 15 | 7 | 100 |
| 2000 | 30 | 18 | 29 | 16 | 7 | 100 |
| 2015 | 26 | 17 | 29 | 20 | 8 | 100 |

* These age groups vary in length.
** Around ICPD, Cairo.
Source: Tables 1-3 are from *UN Estimates*, 2000 Revision.

Table 2
Numerical (millions) and percentage growth in the new entrant age group (15-29 years), 1985-2000 and 2000-2015

| | 1985-2000 | | 2000-2015 | |
|---|---|---|---|---|
| | Number | Per cent | Number | Per cent |
| World | 240 | 18 | 209 | 13 |
| France | -1 | -7 | -1 | -7 |
| Russian Federation | -1 | -3 | -7 | -22 |
| United States | -5 | -9 | 9 | 16 |
| Mexico | 9 | 37 | 1 | 4 |
| Brazil | 9 | 23 | [-0.2] | [-0.3] |
| China | -4 | -1 | -7 | -2 |
| India | 63 | 30 | 55 | 20 |
| Thailand | 2 | 12 | -1 | -6 |
| South Africa | 3 | 35 | 1 | 7 |
| Congo (Dem. Rep.) | 5 | 64 | 10 | 79 |
| Nigeria | 12 | 63 | 17 | 54 |
| Kenya | 4 | 83 | 3 | 33 |

To develop this point in the text I turn to case studies covering countries and spanning two periods covered in Tables 2 and 3, for the key age span, 15-29 years, an age group critical for labour supply and for human capital policies. In these tables very significant differences are seen. In Table 2, slow-growth countries, with the exception of the

Table 3
Per cent of the total population comprised in the labour force, new entrant age groups (15-29 years), 1985, 2000, 2015, world and case-study countries

| | 1985 | 2000 | 2015 |
|---|---|---|---|
| World | 21 | 18 | 17 |
| France | 16 | 13 | 12 |
| Russian Federation | 15 | 16 | 11 |
| United States | 17 | 14 | 15 |
| Mexico | 22 | 20 | 17 |
| Brazil | 20 | 20 | 16 |
| China | 22 | 16 | 14 |
| India | 20 | 19 | 19 |
| Thailand | 22 | 19 | 15 |
| South Africa | 19 | 21 | 21 |
| Congo (Dem. Rep.) | 18 | 19 | 20 |
| Nigeria | 19 | 20 | 21 |
| Kenya | 19 | 23 | 22 |

United States, show percentage and numerical declines at these ages, dramatically so in the case of the Russian Federation. But so too do some recently high-growth countries, Brazil, China and Thailand. As in the case of Taiwan,[3] a labour surplus at these ages will rapidly translate into a deficit. It also means, of course, that these countries will be less likely to export migrant workers.

The remaining countries show increases in the sizes of the new entrant age group, at levels in Congo, Kenya and Nigeria that will be very difficult to accommodate. Lower increases are seen in particular in Mexico and South Africa. In passing, it is worth noting that three of the case-study countries, India, Congo and Nigeria will together contribute 42% of the net global growth of 123,976,000 new entrants to the labor force over that period, and the United States another 5%.

Table 3 shows the per cent of the total population at ages 15-24 years in 1990, 2000 and 2015. Almost a fifth of the entire population worldwide will fall into these two quinquennial age ranges, although

3. Verbal intervention, Dr Tsay, Academia Sinica, *International Meeting on Age-Structural Transitions and Policy Dynamics, IUSSP/Academia Sinica*, Dec. 2001. Cited in IUSSP Policy Paper (on web) prepared by the present author.

the per cent is going down gradually. For the case studies three patterns are seen. There are those countries in which the proportions at new entrant ages remain more or less constant, normally at around 20%, but only 15% in the case of the United States. There are those for which the per cent at those ages declines gradually but steadily, France being an example. But so too, and more significantly, are Mexico, China and Thailand. Then the Russian Federation sees a wave and then a trough. Each of these patterns will require totally different labour-market policies.

## 4. Towards a Synthesis: Policy Implications of Age-Structural Transitions

The issues raised in this paper are highly applied not just for economic development, but for all areas of public policy and for market sectors. The results support very strongly more generic arguments relating to "demographic dividends" and "windows of opportunity". But in this paper the waves and cohort flows that generate these bonuses for some countries were shown often to be complex, and for some populations produce severe levels of turbulence (perturbations). It is these perturbations that will exert pressures on supply and demand in all for goods and services sectors and thus create problems for policy as much as for markets. And it is these perturbations and their impacts that, along with policy and market responses will determine whether or not windows of opportunity can be exploited adequately.

Age-structural transitions are underway, but much of the world is still at an intermediate stage. It is this temporal factor that has produced the demographic bonuses, the windows of opportunity. The world is not, in fact, ageing at present, but is "middle ageing". In 1995, 32% of its population were aged less than 15 years, 46% were at 15-44 years, and only 22% above this: and in 2015 almost three quarters will still be below 45 years, although by then the per cent above 45 will have passed the proportion aged less than 15 years. In this paper these broad age groups have been disaggregated further and also the implications of cohort flows indicated. Whether broader or more specific age ranges are used one point is clear: that age-structural changes have major implications for policy and planning.

This also supports another argument that Bloom *et al.* (2003) underline in their analysis: that it is only when age-structural changes, as against overall growth, are endogenised in planning models that the links between population and development become highlighted. In a case study on the OECD, Lindh and Malmberg (1999) demonstrate this point empirically. From my personal experience working with and evaluating planning ministries/units across Anglophone and Francophone Africa, Asia and the Pacific, the observation can be made that there is another dimension to this:

> "Traditionally, planning has had a relatively short-term horizon, say 3-5 years, while the processes of demographic change are generally of a gradual and long-term character, although certain processes, such as migration, have sectoral impacts over the short to medium term…" (Pool 1994a: 283; my translation).

More pragmatically, a constraint has been that much of "economic planning" has really been confined to the financial and fiscal aspects of public-sector management; more cynically often what was seen as "planning" was little more than a "wish-list" of capital projects put up for funding.

But the arguments that Lindh and Malmberg put forward (1999) raise another related and operationally important question. As was noted earlier, needs and behaviours vary between life-cycle stages, as do financial and other capacities. But sectoral policies also are directed at different stages, for example health at the young and old, education at the young, housing and employment at youth and the middle-aged, and income support at the elderly (Pool 1994b: 66; elaborated in Pool, 2005). This thus holds true for policies that, according to Bloom *et al.*, deal with two of the "mechanisms" that "deliver" the dividend labour supply and human capital. But it also is the case for the third mechanism "savings" (Bloom *et al.* 2003: 39-42). It is the working-age populations that save, and it is also this group that pays the taxes that support the dependent populations. Recent research on Asian economies strongly supports the links between age-structural changes, and savings and investment, and thus fiscal capacity (e.g. Higgins and Williamson 1997). Therefore, age-structural changes are not just important for those sectors that deal with social policy, including employment and other human-capital questions, but also with those that deal with the more financial and fiscal sectors of planning and

policy, that have traditionally abjured any interest in population concerns. In developed countries it has been the fiscal and actuarial implications of population ageing, far less the human-capital or social-sector impacts, that have been the trigger that has produced an interest in age structures among Treasury or Ministry of Finance officials.

With growing interest in age-structural matters and the recognition that a window of opportunity exists, it is important to signal that the changes involved are very complex and vary between countries, as the data presented earlier show. There are waves, disordered cohort flows, and coterminous changes at different life-cycle stages. The last phenomenon is clearly a source for intergenerational competition for resources.

For policymakers and planners the message of all of this is simple: modeling will be more complex regardless of whether or not the age-structural changes imply favourable or unfavourable social and economic consequences. Moreover, waves, regular or irregular, are followed by troughs, and this means planning for peak demand, and then pulling back and directing attention to another life-cycle stage with different sets of needs and behaviours. The more disordered the flows, the more intense the wave and trough patterns and the shorter the durations involved for formulating and implementing planning strategies. Even countries that are going through seemingly smooth and rapid demographic transitions through a fertility decline, may still be subject to multiple wave effects at short intervals as the parents drawn from large birth cohorts produce large birth cohorts. Kenya was shown to be an example of this.

The situation is, in fact, more complex even than this might suggest. Age-structural transitions are likely also to be coterminous with other major demographic changes.

As was stressed in Chapter One, and will be throughout this volume, the *Demographic Transition* is the driver of ASTs. But, it must be emphasised that ASTs, in turn, have an impact on demographic transition. For example, a population with an age structure weighted towards the younger, more fecundable, reproductive ages will have a greater potential for high fertility, than one with higher proportions at older reproductive ages.

The *Epidemiological Transition* is also linked to ASTs. An epidemiological transition at first, is played out by rapid declines in the force of mortality at the younger ages, but later sees the force shift to older and

older ages. In developed countries, the possibilities for further increases in survivorship depend on improvements at older ages, as the probability of surviving from birth to old age is very high except for a very small minority in each cohort. But equally well, the age composition of a population is related to its potential for mortality.

The same applies to *Transitions in Family Formation, Structures and Forms*. The interlinkages between ASTs and the family transition are very strong. The sizes and age structures of families are an obvious manifestation, but this is true for the context in which family formation takes place – the forms of the union (marriage or cohabitation, and whether or not ex-nuptial births are prevalent or rare), the structures of unions (e.g., nuclear or extended; the support networks), and the actual process of childbearing (e.g., timing, spacing and limitation, that is the central concerns of reproductive-choice initiatives). For example, Muslim countries in which almost all childbearing is nuptial, but in which ages at marriage are late and celibacy levels high, face a particularly critical interface between their family transitions and their ASTs.[4]

*The Industrial Labour-Force Sectoral Transformation* is yet another area of social and economic change mediated by ASTs. Labour-force transformation is a transition basic to development theory. The growth of the tertiary sector, and especially the highly skilled, poses particular problems for countries going through rapid ASTs and that wish to exploit a "window of opportunity" by upgrading their human capital. Essentially they will face pressures on human capital formation and utilisation.

The same applies to *Mobility Transitions* which are also related to industrial transformations. The links to these cannot be overemphasized. But as this is the subject of a paper in this volume by Gultiano and Xenos, there is no need here to elaborate on this issue.

The shift from grains to meat proteins, or *Nutritional Transitions* as is occurring across Asia, is another co-varying factor. The impacts of this transition will be most marked in the large cohorts that are currently at youth or young adult ages. Moreover, it has been an age-structural transition that has generated the incomes allowing Asian populations to save invest and to change their patterns of consumption (Higgins and Williamson 1977).

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4. The paper on Iran by Mehryar and Ahmad-Nia in this volume and a presentation by Ben Brahim on Tunisia at the Workshop both develop this theme.

To sum, then, the nations of the world are at different stages in their ASTs. These in turn are related to all the major sociodemographic changes to which societies are subject.

For some countries, at present, there are windows of opportunity, but they do not exist for all countries, and their attributes vary considerably. Moreover, variability will be seen not only in the longer run, but also over the short to medium term. This may be a case, in fact, where the "devil is in the detail". Exploitation of windows of opportunity so as to realise the potential dividend will, therefore, require the proactive policy management of wave and trough effects that will vary from country to country.

It will also depend on prevailing conditions in each country. For example, among sub-Saharan countries South Africa is going through a less disordered transition. Yet its capacity to exploit any windows of opportunity will depend on how it is able to respond to major labor-market problems (Amoateng *et al.* 2004).

The "detail" involves, among other things, the effects of cohort flows over the next decade or so. Many populations will be subject to wave effects (and troughs) that will have a major impact on their planning for development. This theme will be picked up again in the country case studies and also in the conclusion to this volume.

***Acknowledgements***

A number of the ideas presented here owe their gestation to presentations I have prepared for seminars: as Conférencier invité, Association canadienne-française pour l'Avancement des Sciences, Montreal, May 2000; for two meetings of the IUSSP Committee on Age Structure and Policy, Phuket, Nov. 2000 (posted on the Asian Meta-Centre web) and Tokyo, March 2001 (one published in 2005; one under editorial review); a policy paper for the same committee to a meeting in Taipei, Dec. 2001 (posted on the IUSSP web); and for the series Séminaires du Lundi, INED, Paris, May 2002.

The critiques of Jean-Claude Chesnais, and discussions with colleagues on the IUSSP Committee, especially its Chairman Shripad Tuljapurkar, have been very valuable. Comments of Kourtoum Nacro were invaluable and have been responded to here. She raised the issue faced by policymakers: what is going to happen in the near future?

Related work in New Zealand has been funded by the Foundation for Research, Science and Technology and presented at a major Government-sponsored Social Policy Research and Evaluation conference, Wellington, April 2003 (Pool 2003). I thank Sandra Baxendine, Research Statistician at the Population Studies Centre, for technical and computing support.

**References**

AMOATENG, A, KALULE-SAHITI, I, LUCAS, D (2004) "South Africa's Human Capital in the 1990s", *Applied Population and Policy*, 1(2): 123-31.

BLOOM, D, CANNING, D and SEVILLA, J (2003) *The Demographic Dividend: A New Perspective on the Economic Consequences of Population Change*, RAND, Santa Monica, Calif.

DITTGEN, A (2002) "Après la transition démographique: l'équilibre ou les turbulences ?", in AIDELF (eds) *Vivre plus longtemps, avoir moins d'enfants : quelles implications ? Colloque international de Byblos-Jbeil (Liban)*, Presses Universitaires de France, Paris: 547-555.

DYSON, T and MURPHY, M (1985) "The Onset of Fertility Transition", *Population and Development Review*, 11(3): 399-440.

HIGGINS, M and WILLIAMSON J (1997) "Age Structure and Dependence on Foreign Capital", *Population and Development Review*, 23: 261-93.

LINDH, T and MALMBERG, B (1999) "Age-Structure Effects and Growth in the OECD, 1950-1990", *Population Economics*, 12(3): 431-50.

POOL, I (1994a) "Problèmes opérationnels de la population et planification du développement, expérience pratique dans le Tiers Monde", in Institut de Démographie UCL, CIDEP, CEPED (eds) *Intégrer Population et Développement. Chaire Quetelet 1990*, Academia/L'Harmattan, Louvain-la-Neuve/Paris: 275-88.

POOL, I (1994b) *The World's Caring Capacity: Population Compositional Aspects*, Independent Commission, Population and Quality of Life, Paris.

POOL, I (2000) "Vers un modèle de la 'transition âge-structurelle' : une conséquence, mais aussi une composante de la transition démographique", Paper, *Conférence de l'Association canadienne-française pour l'avancement des sciences*, Montreal, May.

POOL, I (2003) "Ageing, Population Waves, Disordered Cohorts and Policy", *New Zealand Population Review*, "Special Issue: Population and Social Policy", 29(1): 19-40.

POOL, I (2005) "Age-Structural Transitions and Policy: Towards Frameworks", in Tuljapurkar, S, Pool, I and Prachuabmoh, V (eds) *Riding the Age Waves. Vol. I: Population Resources and Development*, IUSSP, International Studies in Population, Dordrecht, Springer: 13-40.

RINDFUSS, R (1991) "The Young Adult Years: Diversity, Structural Change and Fertility", *Demography*, 28(4): 493-512.

TEITELBAUM, M (2003) Oral Presentation, Annual Welfare Seminar, National Institute for Population and Social Security (Japan), "Population Decline and Immigration Policies: Japan's Choice", Tokyo, Dec. 16th.

UNITED NATIONS (2000) *Replacement Migration: Is It a Solution to Declining or Ageing Populations?*, UN Population Division, NY.

Appendix Table 1
Effects of momentum on the growth of populations at various life-cycle stages, 1985-2000 and 2000-2015:
Growth by age group, years t to t+15, as a percentage of the total population (all ages) at year t.
World regions and selected case-study countries

| Region | 1985-2000 | | | | | 2000-2015 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | <15 | 15-29 | 30-44 | 45-59 | 60+ | <15 | 15-29 | 30-44 | 45-59 | 60+ |
| **WORLD** | 4.2 | 5.0 | 8.2 | 4.5 | 3.7 | 1.0 | 3.5 | 3.8 | 6.2 | 4.6 |
| **AFRICA** | 18.0 | 14.4 | 8.3 | 4.0 | 2.6 | 13.1 | 12.0 | 7.8 | 4.2 | 2.7 |
| **ASIA** | 3.8 | 5.2 | 9.4 | 5.1 | 3.9 | -0.4 | 3.1 | 4.1 | 7.1 | 5.0 |
| **EUROPE** | -3.3 | -1.8 | 3.3 | 0.7 | 4.0 | -4.0 | -3.4 | -1.9 | 3.1 | 3.1 |
| **LATIN AMERICA AND THE CARIBBEAN** | 2.9 | 8.0 | 9.6 | 5.5 | 3.5 | 0.4 | 2.5 | 6.3 | 7.1 | 5.1 |
| **NORTH. AMERICA** | 3.4 | -2.3 | 5.8 | 7.3 | 2.7 | -0.6 | 3.1 | -1.6 | 5.3 | 7.1 |
| **OCEANIA** | 4.0 | 3.0 | 6.7 | 7.1 | 4.6 | 1.8 | 3.3 | 2.3 | 5.1 | 6.6 |
| Brazil | -0.3 | 6.8 | 10.2 | 5.8 | 3.6 | -0.1 | -0.1 | 5.3 | 7.6 | 5.4 |
| China | -0.7 | -0.4 | 10.2 | 6.0 | 4.0 | -3.3 | -0.5 | -0.1 | 8.4 | 6.2 |
| Dem. Rep. of the Congo | 32.4 | 16.2 | 7.4 | 3.7 | 2.8 | 30.5 | 20.2 | 8.5 | 3.4 | 2.3 |
| France | -1.1 | -1.5 | 2.5 | 3.5 | 3.8 | -0.6 | -1.3 | -1.7 | 2.5 | 5.6 |
| India | 6.7 | 8.3 | 9.1 | 4.4 | 3.4 | -0.7 | 5.5 | 6.3 | 6.7 | 4.2 |
| Kenya | 17.0 | 21.6 | 10.4 | 3.8 | 2.3 | 6.5 | 10.2 | 8.4 | 3.4 | 2.0 |
| Mexico | 1.1 | 10.5 | 10.3 | 5.6 | 3.5 | -1.4 | 1.1 | 8.0 | 7.6 | 5.1 |
| Nigeria | 23.2 | 16.2 | 7.7 | 4.0 | 2.6 | 15.0 | 14.9 | 8.8 | 3.8 | 2.6 |
| Russian Federation | -4.4 | -0.8 | 3.8 | -2.0 | 4.9 | -5.5 | -4.9 | -1.4 | 2.9 | 0.4 |
| South Africa | 4.8 | 10.0 | 9.8 | 5.0 | 2.5 | -2.6 | 2.1 | -1.6 | 2.2 | 2.8 |
| Thailand | -2.3 | 3.7 | 12.4 | 5.8 | 4.6 | -1.3 | -1.6 | 3.1 | 9.5 | 5.8 |
| United States of America | 3.6 | -2.2 | 5.7 | 7.2 | 2.5 | -0.5 | 3.3 | -1.5 | 5.2 | 7.0 |
| **Sub-Saharan Africa** | 20.9 | 15.0 | 7.7 | 3.8 | 2.5 | 16.1 | 13.6 | 7.6 | 3.5 | 2.4 |

Source: United Nations Projections, 2000 Revision.

Appendix Table 2
Effects of momentum on the growth of populations at various life-cycle stages, 1985-2000 and 2000-2015: Numerical change by age group, years t to t+15. World regions and selected case-study countries

| Region | 1985-2000 | | | | |
|---|---|---|---|---|---|
| | <15 | 15-29 | 30-44 | 45-59 | 60+ |
| **WORLD** | 203,802 | 239,798 | 394,648 | 216,137 | 177,821 |
| **AFRICA** | 96,969 | 77,542 | 44,617 | 21,728 | 13,756 |
| **ASIA** | 108,329 | 148,587 | 271,211 | 145,910 | 113,151 |
| **EUROPE** | -23,205 | -12,762 | 23,212 | 5,136 | 28,242 |
| **LATIN AMERICA AND THE CARIBBEAN** | 11,583 | 31,870 | 38,411 | 21,938 | 14,183 |
| **NORTHERN AMERICA** | 9,143 | -6,161 | 15,558 | 19,704 | 7,379 |
| **OCEANIA** | 983 | 722 | 1,639 | 1,721 | 1,109 |
| Brazil | -400 | 9,150 | 13,745 | 7,890 | 4,819 |
| China | -7,438 | -4,146 | 109,270 | 64,585 | 42,687 |
| Dem. Rep. of the Congo | 10,171 | 5,091 | 2,315 | 1,154 | 869 |
| France | -625 | -839 | 1,389 | 1,938 | 2,090 |
| India | 51,035 | 63,447 | 69,741 | 33,962 | 26,290 |
| Kenya | 3,364 | 4,262 | 2,058 | 760 | 459 |
| Mexico | 839 | 7,889 | 7,809 | 4,219 | 2,655 |
| Nigeria | 17,216 | 12,022 | 5,688 | 2,953 | 1,915 |
| Russian Federation | -6,355 | -1,081 | 5,435 | -2,881 | 7,043 |
| South Africa | 1,560 | 3,285 | 3,225 | 1,629 | 829 |
| Thailand | -1,164 | 1,892 | 6,276 | 2,954 | 2,307 |
| United States of America | 8,762 | -5,405 | 13,796 | 17,530 | 6,016 |
| **Sub-Saharan Africa** | 90,596 | 65,315 | 33,241 | 16,583 | 10,737 |

(cont.)

Appendix Table 2 (continued)
Effects of momentum on the growth of populations at various life-cycle stages, 1985-2000 and 2000-2015:
Numerical change by age group, years t to t+15. World regions and selected case-study countries

| Region | 2000-2015 | | | | |
|---|---|---|---|---|---|
| | <15 | 15-29 | 30-44 | 45-59 | 60+ |
| **WORLD** | 59,596 | 209,478 | 228,829 | 373,396 | 279,348 |
| **AFRICA** | 103,676 | 95,374 | 62,296 | 33,648 | 21,389 |
| **ASIA** | -15,917 | 115,409 | 151,930 | 262,323 | 184,539 |
| **EUROPE** | -28,739 | -24,943 | -13,979 | 22,280 | 22,583 |
| **LATIN AMERICA AND THE CARIBBEAN** | 1,971 | 13,043 | 32,785 | 37,013 | 26,487 |
| **NORTHERN AMERICA** | -1,948 | 9,598 | -4,891 | 16,563 | 22,343 |
| **OCEANIA** | 552 | 998 | 687 | 1,569 | 2,008 |
| Brazil | -236 | -159 | 9,099 | 12,996 | 9,286 |
| China | -42,678 | -6,739 | -1,355 | 106,753 | 79,102 |
| Dem. Rep. of the Congo | 15,528 | 10,290 | 4,341 | 1,752 | 1,185 |
| France | -337 | -796 | -988 | 1,483 | 3,293 |
| India | -6,737 | 55,343 | 63,329 | 67,234 | 42,378 |
| Kenya | 1,979 | 3,133 | 2,567 | 1,047 | 606 |
| Mexico | -1,400 | 1,133 | 7,942 | 7,554 | 5,073 |
| Nigeria | 17,080 | 16,978 | 10,037 | 4,362 | 2,996 |
| Russian Federation | -7,974 | -7,113 | -1,977 | 4,272 | 616 |
| South Africa | -1,123 | 903 | -675 | 972 | 1,229 |
| Thailand | -815 | -1,012 | 1,939 | 5,948 | 3,625 |
| United States of America | -1,549 | 9,302 | -4,236 | 14,760 | 19,718 |
| **Sub-Saharan Africa** | 104,763 | 88,280 | 49,520 | 22,518 | 15,546 |

Source: United Nations Projections, 2000 Revision.

# 3

# FORECASTING GLOBAL INCOME GROWTH USING AGE-STRUCTURAL PROJECTIONS

**Bo MALMBERG and Thomas LINDH**[1]

***Abstract***

Demographic projections of age structure provide the best information available on long-term human resources and demand. In current analyses fairly robust correlations with GDP and GDP growth have been identified. In this paper we use these two facts and study the forecasting properties of demographically based models. Extending the forecasts to 2050 suggests that due to fertility decreases poor countries of today will start to catch up with developed economies in which the growth process will stagnate due to the growth of the retired population.

## 1. Forecasting Global Growth Using Age-Structure Projections

Will the current income gaps between the developed and the developing world persist or will we have a long-run convergence between different parts of the world? This question has been thoroughly researched in cross-country convergence studies over the last two decades where a rather pessimistic view has emerged. Given current structures the indication is that convergence only takes place within certain clubs of countries like the OECD, while the poorest part of the

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world is actually diverging relative to the developed countries. Of course, the conclusion is not that the poverty of some countries is ordained by destiny, but rather that drastic internal structural change combined with international aid and pressures is needed in order to bring an end to the extreme poverty in the world. Based on rather fragile empirical evidence strategies such as technological change, human capital, free market institutions and strict budgetary discipline, just to mention a few, have been more or less emphasized in the debate. Long-term projections of income have been hard to achieve from these hypotheses, since the implied driving forces are hard to measure and even harder to project into the future.

This paper draws on another fundamental force driving growth: demographic change (Malmberg 1994; Kelley and Schmidt 1995; Bloom and Williamson 1997; Higgins and Williamson 1997; Lindh and Malmberg 1999). This is a variable that is relatively easy to measure, and can be projected into the future with at least reasonably low uncertainty for long periods of time. Our focus on demography does not mean that the importance of other factors is downplayed. However, access to population projections makes forecasting based on demographic factors more straightforward than, for example, forecasting based on the effects of institutional change. The focus in this paper is on evaluating the forecasting performance of demographically based models. We estimate demographically based models of income as a function of age structure, urbanization and life expectancy, and test their statistical properties both in and out of sample. Finally we use UN projections of age structure to derive forecasts of global income levels and the evolution up to 2050.

Our conclusion is that such forecasts behave reasonably well in predicting income and in the long term they show promise of being a much more robust method than any available alternative. The long-run forecasts also indicate that, as a consequence of the demographic age transition, primarily decreasing shares of children and increasing longevity, developing countries (with the possible exception of AIDS inflicted countries in sub-Saharan Africa) will tend to experience faster economic growth and thus start converging to the income levels of the developed world.

Although the contribution of this paper is intended to be in forecasting, it is of some importance to make clear that the use of age-structural variables for income forecasting does have an extensive

theoretical and empirical foundation, so the next section of the paper is devoted to an account of the facts and theories behind the demographic age transition and its impact on the economy. Section 3 presents the estimated model and the forecast. The concluding section argues that our forecasts inspire confidence in a rather bright global future.

## 2. Starting Point: The Demographic Transition

What we now know as the demographic transition model was developed in the second quarter of the 20th century by demographers observing variations in death rates and birth rates across countries and over time. The finding was that in the Western cultural area there has been a general process of change from the relative population stability at high levels of mortality and fertility to the slowing growth or actual decline of population numbers at low levels of mortality and fertility which characterized the interwar period. The initial effect was a decrease in mortality, leaving more or less intact the large-family pattern. For reasons that are not entirely clear a small-family pattern became not only an ideal but a goal realized by increasing proportions of the population. Birth rates fell rapidly, at first in cities, later in the surrounding rural areas (Taeuber 1945).

The prerequisite for this observation was an increasing effort to assemble demographic data from the 19th century and onwards that had made available time series stretching over multiple decades or longer. Researchers in the inter-war era, thus, could base their analysis of population trends on comparatively rich empirical material. However, the concept of demographic transition was not only used as a name for an empirical pattern. Instead the researchers who introduced the term saw these trends in mortality and fertility as the expression of an underlying social transformation process. Moreover, their conclusion from observing similar demographic trends in different countries was that the process of demographic transition would not be restricted to Europe but would spread also to other parts of the world. In fact, Irene B. Taeuber's original formulation of the transition idea appears in a paper that analyses the population development of Southern and Eastern Asia.

In 1945 the idea that the world would witness demographic transitions throughout Asia, Africa and America was basically a scientific

hypothesis yet to be verified or rejected. The key assumption behind this hypothesis was essentially a belief that the technologies giving rise to lower mortality would continue to spread to those parts of the world that still suffered from high mortality levels. Developments after 1945 have demonstrated that this assumption was well-founded, although even proponents of the transition hypothesis soon became surprised by the amazing decline of mortality in underdeveloped areas (Davis 1956).

Today, almost 60 years later we can conclude that the demographic transition hypothesis has proved to be correct. First, the mortality decline observed in the Western world and in parts of Asia before 1945 has indeed spread to practically all parts of the world. Before 1945 life expectancy at birth in many non-Western populations was appreciably below 40 years. In India (1941-50) and also in Mauritius (1942-46), for example, the expectation of life at birth has been estimated to be only 32 years (Stolnitz 1965). Similarly, the "Bantu" population of South Africa had an estimated life expectancy at birth of 33.6 years in 1936-46 (Van de Walle and Page 1969). Life expectancy in China was lower still: data on the Chinese farming population in 1929-31 indicate values of 28.1 years in North China and 24.2 years in South China (Barclay *et al.* 1976). In other parts of the world the picture was somewhat brighter with male life expectancy at birth at 40.9 years in Chile (1940), 41.1 years in Taiwan (1936-41), 42.1 years in Egypt (1937) (Toppozada 1968), 44.5 years in Trinidad and Tobago (1930-32), 45.1 years in Puerto Rico (1939-41), 45.8 years in Venezuela (1942-42), and 46.9 years in Japan (1935-36) (Stolnitz 1965).

Since the Second World War life expectancy in these countries has risen dramatically. The most impressive gains have been made in China. In 1999 the World Bank estimated a life expectancy at birth of 70 years. That is a gain of 44 years compared with the life expectancy for the Chinese farming population around 1930. Japan, Taiwan and Chile have had gains in life expectancy around 35 years. The gains in India, Puerto Rico, and Trinidad and Tobago are around 30 years whereas Egypt and Venezuela have gained about 25 years. Also in South Africa there was a 23 years gain in life expectancy up to 1980, but nine years of this gain have been lost between 1980 and 1999 primarily because of AIDS-related deaths. Of the large world regions (East Asia and Pacific, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa, South Asia, and sub-Saharan Africa) only sub-Saharan Africa now, despite a substantial increase, has

a life expectancy at birth below 50 years. In the rest of the world life expectancy is above 60 years.

Also the second prediction of the demographic transition hypothesis – that birth rates for an extended period will stay high when the death rates have begun to decline – has proved correct. Using UN data (*World Population Prospects – The 2000 Revision*) this process can be most easily traced in African countries like Kenya, Ethiopia and Nigeria where falling death rates in combination with relatively stable birth rates led to accelerated population growth during the 1950s, 1960s, and 1970s. However, the starting point of the UN data is the 1950-54 period which means that this data set does not capture the dramatic declines in death rates that followed in the first few years after 1945. According to a study by Kingsley Davis, based on 18 underdeveloped areas, not chosen because they had unusual declines in mortality but because they were representative of different areas and had fairly constant boundaries and a relatively continuous series of registered death statistics, the total decline in the crude death rate between 1935 and the 1950-54 period can be estimated to have been 58%, with the largest part of the decline coming after 1945. This large decline up to the 1950-54 period implies that the UN data give us a picture of what happens to a population directly after a sharp mortality reduction. If Kingsley Davis' estimate is correct – and assuming stable birth rates – the population growth rate in the less developed countries (UN 2001 definition) would have accelerated from 0.3% annually in 1935 to 2.1% in 1950-54. This growth rate was the result of a crude birth rate of 44.6 and a crude death rate coming down from 41.2 to 24.1. Declining death rates thus led to accelerated population growth, exactly as the Princeton demographers had predicted (Davis 1956).

Towards the end of the 1960s the death rate of the less developed countries had dropped a further nine points but the birth rate had only declined by half as much. Population growth in the less developed countries had thus accelerated further and now stood at 2.5% annually. The end of the 1960s, then, was a time when the transition hypothesis did not seem to be correct. Had not the hypothesis assumed that declining death rates would be followed by lower birth rates? And what would happen if birth rates remained high? This, thus, was also a good time for doomsday predictions concerning the future of the earth and its population (Ehrlich 1968; Ehrlich and Ehrlich 1970). Not everyone lost their nerves, though. The UN forecasters continued to base their

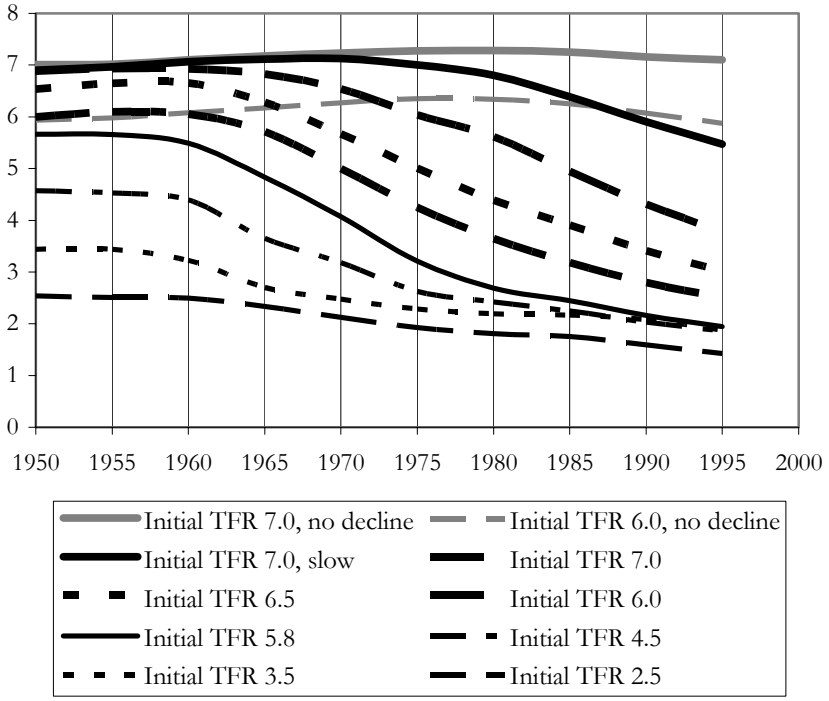
projections on the assumption of a slow but continuing fertility decline that would bring down the population growth rate. And – as it turned out – the UN forecasters were right. Between 1965-69 and 1970-74 there came an important shift in population trends as growth rates in Eastern Asia and South-Eastern Asia started to decline. This had happened in Korea and in Latin America already some years earlier but it was with the Asian turn-around that the shifting trend became globally significant. Later in the 1970s population growth rates started to decline in Southern Africa and in the mid 1980s, population growth began to slow also in North Africa, Western and South-Central Asia. In the early 1990s, it happened in Western Africa and in Eastern Africa too, although in the latter case this slowdown was partly due to an increase in the death rates. And at the end of the 1990s, Middle Africa also seems to have passed its peak in terms of its population growth rate.

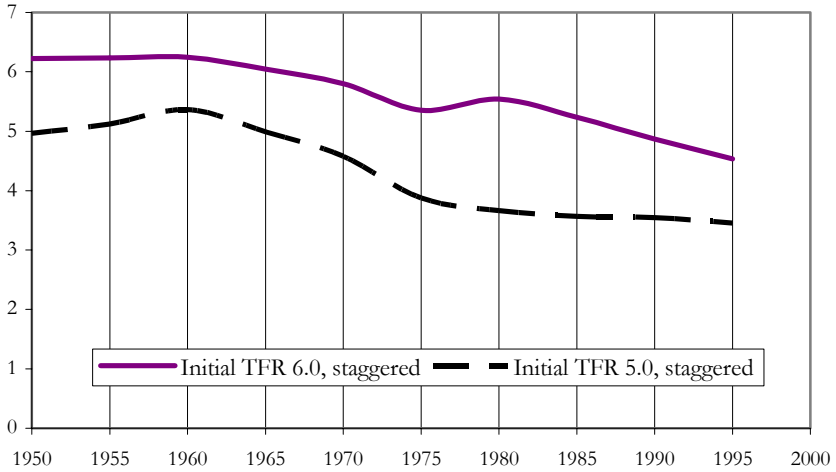
A more detailed view of factors behind the downward trend in population growth comes from a look at how total fertility rates have changed since 1950. In Figure 1 , the most important patterns of fertility that, according to United Nations (2001), have changed between 1950 and 2000 are outlined. Countries with a similar pattern of fertility change have been grouped together and for each year the mean fertility rate in each group has been calculated. Figure 1 shows clearly that fertility rates differ much across the world and that there are different patterns of fertility change. However, there are also strong common trends. In all groups except two, fertility has gone down since 1950 although at different rates.

Only two groups of countries have a record of no significant decline in mortality. In these groups we find a number of very poor countries many of which have experienced strong social disruption: Afghanistan, Angola, Burkina Faso, Burundi, Ethiopia, Liberia, Malawi, Mali, Niger, Somalia, Uganda, and Yemen all belong to the group where the total fertility rate still is close to 7 children per woman. Also for Bhutan, Cameroon, the Central African Republic, Chad, Congo, the Democratic Republic of the Congo, Equatorial Guinea, Gambia, Guinea-Bissau, Lao People's Democratic Republic, Mauritania, Mozambique, Namibia, and Pakistan there has been very little change in the total fertility rate, almost constant around 6 children per woman.

Another group for which the fertility rate in 1995-1999 is still very high, around 5.4 births per woman, is made up by Benin, Comoros, Côte d'Ivoire, Djibouti, Eritrea, Ghana, Guatemala, Guinea, Iraq, Jor-

Figure 1
Different types of change in TFR 1950-2000



dan, Kenya, Libya, Madagascar, Maldives, Nigeria, Oman, Rwanda, Saudi Arabia, Senegal, Solomon Islands, Sudan, Swaziland, the Syrian Arab Republic, Togo, the United Republic of Tanzania, Zambia, and Zimbabwe. For this group starting with a TFR of 7 in 1950, there has, however, been an appreciable reduction in the fertility rate, especially since 1980. This is a trend which, if we are to judge from the development of other groups, can be expected to continue.

The group consisting of Algeria, Bangladesh, Belize, Bolivia, Botswana, Cape Verde, Egypt, Honduras, Iran (Islamic Republic of), Mongolia, Morocco, Nicaragua, Philippines, Qatar, Samoa, Tajikistan, the United Arab Emirates, Vanuatu, and Western Sahara in 1950 also had an average TFR of 7 but by the end of the 1990s the average rate had been reduced to 3.8, a very considerable reduction.

The three groups Bahrain, Brunei Darussalam, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Fiji, India, Kuwait, Malaysia, Mexico, Myanmar, Peru, Saint Lucia, South Africa, Tunisia, Turkey, Turkmenistan, Uzbekistan, Venezuela, and Viet Nam starting at a TFR of 6.5, followed by Albania, Brazil, French Polynesia, Guyana, Indonesia, Lebanon, Panama, Suriname, and Thailand starting at a TFR of 6.0, and finally Azerbaijan, Chile, China, Guadeloupe, Martinique, Mauritius, the Republic of Korea, Réunion, Sri Lanka, Trinidad and Tobago also starting at a TFR of 6.0 have essentially tracked one another with respect to fertility declines and arrived at mean TFR rates of 3.0, 2.5, and 1.9 respectively in the late 1990s.

In the group Armenia, Bahamas, Barbados, Bosnia and Herzegovina, Hong Kong, Macao, Cuba, Ireland, Israel, Kazakhstan, the Netherlands Antilles, Puerto Rico, and Singapore with a mean TFR in 1950 of about 4.6 it has fallen to 1.9. The last two groups, with 1950 TFRs of 3.5 and 2.5 consist largely of developed countries that already in the beginning of the period had completed the classical fertility transition.

What we can see in Figure 1, then, is a quite impressive corroboration of the demographic transition hypothesis. To be sure, some countries have yet to enter the phase of fertility decline and others have a long way to go before they reach replacement fertility, that is, a level of TFR slightly above 2 that in the long run keeps population size constant. But the patterns of fertility change during the last fifty years strongly suggest that a continuing fertility decline in today's high-fertility countries is to be expected. The Princeton hypothesis of a demographic transition affecting countries all over the world, thus has

turned out to be one of the most successful predictions made by social scientists in the 20th century.

### *2.1. The Age Transition*

In the 1990s different scholars have pointed out that population growth will not be evenly distributed across the different age groups during the demographic transition (Chesnais 1990; Chesnais 1992). On the contrary, as the demographic transition unfolds the growth rate of different age groups will follow an uneven pattern (Malmberg and Sommestad 2000a, 2000b). In some periods during the transition population growth will be concentrated to the youngest part of the population. In other periods it will be the young adult, middle-aged, or old-age population segments that are increasing most rapidly. As pointed out by Bloom *et al.* (2003) this implies that population growth will have coherent effects on per capita income only if it is correct that the economic effects of population growth are the same irrespective of whether it is children, young adults, middle-aged adults, or old-age adults that are increasing in numbers. Even as a scientific simplification that seems to be a rather far-fetched hypothesis.

### *2.2. How Does Age Structure Change During a Demographic Transition?*

This question can be answered both empirically and through the use of demographic models. As it turns out, both methods give very similar results, at least over long periods with moderate levels of immigration and emigration. The typical pattern of a mortality decline followed – after a lag – by declining fertility will generate a very distinct pattern of age-structure change. This pattern can be observed in most countries affected by a demographic transition. One way to summarize is to distinguish four different phases of population growth during the demographic transition:

The first phase following the onset of mortality decline is characterized by an increase in the number of children. The primary reason for this is that in high mortality regimes it is among newborns, infants and young children that the death toll is especially high. So when mortality comes down it is to a large extent the lives of the very youngest that are spared. In time, this increase in the number of children will

also produce increments in the size of the young adult fertile population and – as long as fertility rates are unchanged – this will, by inducing more births, further accelerate the increase in the number of children. This first "child-rich" phase of what can be called the age transition will continue as long as the fertility rate remains high; the fertility decline eventually slows down the increase of the child population.

The second phase is characterized by an expansion of the young adult population. The mechanism behind this expansion is simply that with declining mortality, and later an increase in the number of births, the number of surviving individuals in each cohort will increase. As these ever larger cohorts reach adult ages the young adult population will start to expand. Because it takes time for newborns to reach adult age the young adult phase will start 15-20 years later than the child-rich phase and it will continue 15-20 years after the expansion of the child population has stopped.

The third phase is characterized by an expansion of the middle-aged population. This phase starts when the cohorts enlarged by mortality decline and increases in the number of births reach middle ages. Depending on how one defines "middle age"' this expansion is initiated 20-30 years after the young adult phase starts. It thus takes four to five decades or more before the mortality decline of a demographic transition produces an appreciable increase in the number of middle-aged.

The fourth phase, finally, is reached when the enlarged cohorts reach retirement and is characterized by an expansion of the old-age population. Often, this expansion starts after the fertility rates have dropped to a low level and this means that the old-age phase, and also at least part of the middle-age phase, lies outside the time span that we normally consider when we talk about the demographic transition. In Sweden, for example, the classic transition was complete by the 1930s when the total fertility rate had come down to, or even below, the replacement level. The middle-age phase of the age transition, however, did not end until about 1970 and the old-age phase continued for another two decades.

Two things should be noted about the age transition. First, as pointed out above, the age transition as a phenomenon extends for a considerably longer period than the classical demographic transition. This implies that the demographic transition, because of population momentum, will have social and economic effects also when there are no longer any current changes in the vital rates. Second, it is important

to remember that, to some extent, the phases of the age transition will overlap. Depending on for how long later cohorts keep getting larger than earlier cohorts this time of overlap may be short or long.

The fact that countries with large differences in terms of historical traditions, climate, and geography have gone through demographic transitions that, in terms of changing mortality and birth rates, have been similar, is certainly a challenge to social science. In this study – where the purpose is not to explain why demographic transitions have occurred but to utilize the effect the transitions have on income growth – the existence of numerous instances of demographic transitions in very different contexts is a great advantage creating variation and correlations that can be exploited to forecast income.

### *2.3. The Global Geography of Age Transitions*

How then, has the age transition affected the population structure in different parts of the world. One way to illustrate this is to use the UN data that gives both an account of estimated age structures for the 1959-2000 period and forecasts of population structures for the 2000-2050 period (for details see Malmberg and Sommestad 2000b). Given that the UN provides data for more than 200 different regions and 17 to 20 five-year age groups for a 100-year period implies that it can be hard to get a grip on how the age structure is changing. However, by the use of cluster analysis it is possible to extract a smaller number of characteristic age structures that will capture the typical age distributions that different populations will demonstrate as they go through the age transition (see Figures 2a and 2b).

These typical age structures can be associated with different phases of the age transition. Figure 3 shows, using these typical age patterns, how age structure in the world will change in the next 50 years according to the UN forecast. The remarkable thing is that there will be very drastic changes in the age structure during the next 50 years, especially in regions with a large share of developing countries.

The question now is if these projected changes in the age structure can be used to forecast future levels of per capita income? One indication of this possibility is given in Figure 4 that shows the per capita income level in countries assigned to the different age-structure types of the cluster analysis. Demographically, old countries are rich countries whereas young countries are poor countries.

Figure 2a
Five typical age structures for the period 1950-2025

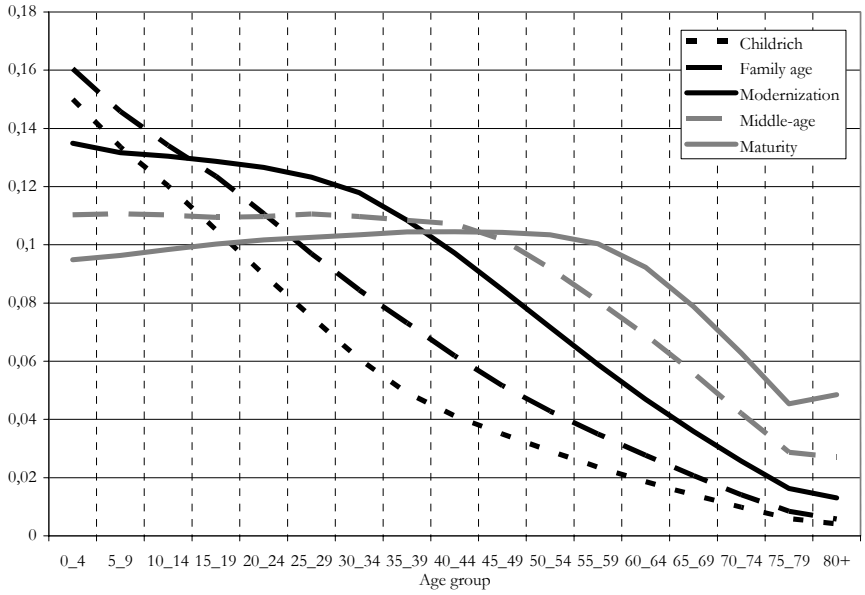



Figure 2b
Advanced ageing

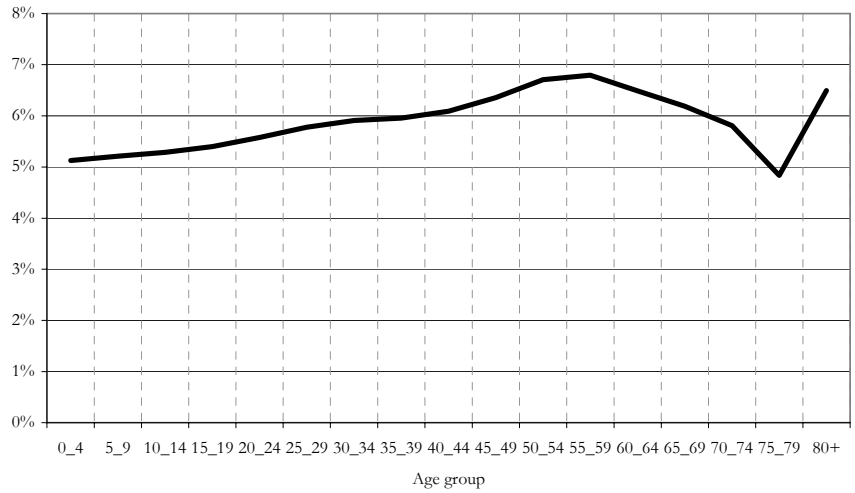
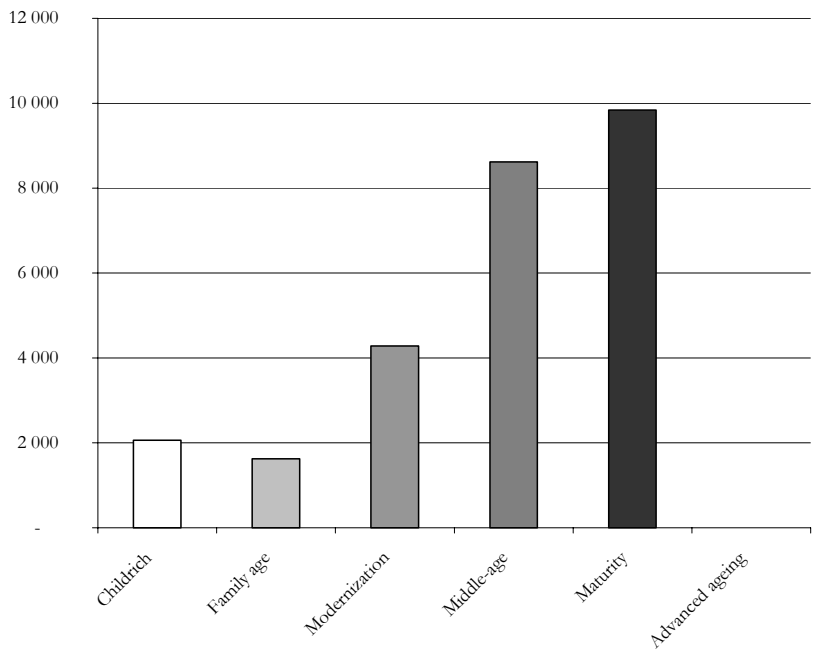


Figure 3
Changes in global age structure 2000-2050.

| Region | 2000 | 2015 | 2030 | 2050 |
|---|---|---|---|---|
| East Africa | Childrich | Childrich | Family age | Modernization |
| Central Africa | Childrich | Childrich | Family age | Modernization |
| West Africa | Childrich | Family age | Family age | Modernization |
| Southern Africa | Family age | Family age | Modernization | Middle-age |
| West Asia | Family age | Modernization | Middle-age | Middle-age |
| Central America | Family age | Modernization | Middle-age | Maturity |
| North Africa | Family age | Modernization | Middle-age | Maturity |
| South Asia | Family age | Modernization | Middle-age | Maturity |
| Southeast Asia | Family age | Modernization | Middle-age | Maturity |
| South America | Modernization | Modernization | Middle-age | Maturity |
| Caribbean | Modernization | Middle-age | Maturity | Maturity |
| East Asia | Modernization | Middle-age | Maturity | Advanced ageing |
| Oceania | Middle-age | Middle-age | Maturity | Maturity |
| Eastern Europe | Middle-age | Maturity | Maturity | Advanced ageing |
| North America | Middle-age | Maturity | Maturity | Advanced ageing |
| Western Europe | Middle-age | Maturity | Advanced ageing | Advanced ageing |
| Northern Europe | Maturity | Maturity | Advanced ageing | Advanced ageing |
| Southern Europe | Maturity | Maturity | Advanced ageing | Advanced ageing |

Figure 4
Per capita income (1990 US$) by type of age structure




The UN predicts that many of the "young" countries will become "old" countries. Does this imply that they also will become rich? If we believe that the income patterns shown in Figure 4 will also remain true over the next 50 years then Figure 3, showing how regions of the world pass from one type of age pattern to another also gives an indication of how per capita incomes will change.

From the recent empirical growth literature analyzing the determinants of per capita income growth (Bloom *et al.* 2003) we also know that there is a robust association between age structure and economic growth, where dependent groups tend to depress growth and the working-age groups tend to enhance it. At present it is not clear which mechanisms these associations rely on. Obviously there should be a direct labor-supply effect making the economy grow faster as the working-age groups increase the fastest, but just as obviously home country bias (Cooper and Kaplanis 1994) in the relation between domestic saving and investment, should make capital accumulation easier

when a large part of the population are in the middle-age phase. There are indirect effects through the public-sector finances since revenue and public consumption and transfers are asymmetrically distributed with respect to age. There are also more long-run mechanisms where for example increasing longevity provides incentives both for retirement saving and increased human-capital accumulation. Several other factors having to do with age-specific demand and income patterns could also be invoked as parts of the explanation. Here we do not go further into this discussion, but are satisfied that there are good solid reasons why we should expect a correlation of GDP growth and age structure.

## 3. Using Demographic-Transition Theory to Forecast Global Income Growth

In the model we will estimate three demographic factors that influence economic development: mortality, age structure and urban structure. Each of these factors are closely connected to the demographic transition. Declining mortality is what triggers the demographic transition. Age-structure change is, as argued above, a process that necessarily accompanies the transition. Urbanization, finally is a spatial redistribution of the population that also has characterized all countries undergoing demographic transition. All these three factors have also been focussed in the discussion of the last decade concerning the determinants of national economic growth.

Our aim is to analyze if in historic data we can find such stable correlations between economic development, mortality, age structure and urban structure that allow us to forecast future trends in income growth.

The model we have chosen to estimate has the following characteristics:

1) *The variable log per capita income is assumed to be a quadratic function of life expectancy at birth.* This allows for the possibility that the relation between development and life expectancy is non-linear.
2) *Per capita income using its log function is assumed to be positively influenced by a well-developed urban system as measured by the population size of the largest city (in logs).* However, urbanization effects are allowed to differ be-

tween countries at different levels of mortality. The positive effect of urban size on economic development has long been a staple of regional development theory. During the 1990s it has also received new interest from leading economists. To measure urbanization by the size of the largest city is, however, to our knowledge a new approach, as well as the idea that city-system effects can differ according to the level of mortality.

3) *Per capita income (expressed in logs) is influenced by shifts in the age structure of the population.* The relations between age structure and per capita income are allowed to change at different levels of mortality. Depending on whether developed or developing countries have been focussed on, there have been some differences in what are the age groups that seem to be the most important for influencing economic development. Moreover, theoretical research on the effects of life expectancy on the optimal length of education, fertility, saving and retirement decisions indicate that the economic life cycle should change in response to changing mortality. This implies that it can be misleading to assume that the profile of age-structure effects on per capita income will be the same in countries at different mortality levels. Rather we would expect the pattern to shift with life expectancy. To capture this our specifications allow for an interaction between age effects and a quadratic function of life expectancy.
4) *Country-specific fixed effects.* To account for the fact that a number of important variables at the country level – for example, institutional factors – have been left out, the estimated model will contain country-specific intercepts. That is, countries that are similar with respect to, for an example, age structure can be at different per capita income levels because of institutional factors.
5) *More recent observations have been given a greater weight than earlier observations.* Through the use of this weighting procedure the estimate of the country-specific intercept will be more strongly influenced by conditions in the later part of the estimation period. Given that we have structural change in the relationships this is important when the purpose is forecasting.

### *3.1. Results*

Table 1 presents the results obtained by estimating the model presented above. All the parameters refer to the same model. Column 1

Table 1
Effects of life expectancy, urban structure
and demographic structure on log per capita income

| | Direct effect | Interaction with life expectancy | Interaction with life expectancy squared |
|---|---|---|---|
| Intercept | -0,3580<br>(-0,31) | | |
| Life expectancy | 0,0276<br>(5,24) | | |
| Life expectancy squared | -0,0009<br>(-3,75) | | |
| Population in largest city (log) | -0,0004<br>(-0,02) | 0,0095<br>(10,62) | . |
| Population share of ages 0-14 (log) | -2,5880<br>(-6,75) | 0,0392<br>(0,88) | 0,0058<br>(3,45) |
| Population share of ages 15-29 (log) | 0,2121<br>(0,83) | 0,0079<br>(0,29) | -0,0025<br>(-2,34) |
| Population share of ages 30-49 (log) | -1,4792<br>(-7,25) | 0,1012<br>(4,78) | 0,0041<br>(4,39) |
| Population share of ages 50 64 (log) | -0,6598<br>(-5,03) | 0,0211<br>(2,28) | 0,0025<br>(4,54) |
| Population share of ages 65+ (log) | -0,1782<br>(-2,62) | 0,0194<br>(3,00) | -0,0008<br>(-2,14) |
| Country effects<br>RMSE | F-ratio<br>1980-1998 | 204.306<br>0.146 | |

gives the results for the direct effects. Column 2 gives the parameter estimates obtained for interactions with life expectancy at birth. Column 3 gives the results from interactions with life expectancy squared. Of the 20 parameter estimates presented in Table 1 all except 5 are significantly different from zero at the 5% level.

The estimates show that life expectancy, as expected, is directly correlated with per capita income. However, the estimates also confirm the hypothesis that life expectancy modifies the effect of demographic structure. Thus, a well developed urban system has a positive effect on

per capita income, but only when life expectancy at birth rises above 62 years. Life expectancy also modifies the effects of age structure.

The estimates show that, as expected, there is a strong negative effect on per capita income from high levels of child dependency. The strongest negative effect of child dependency is found when life expectancy is around 60 years. With further increases in life expectancy the effect becomes somewhat weaker but it is still negative when life expectancy has reached 75 years.

The effect of young adults is much less negative. This implies that per capita income will improve when child dependency declines and the share of young adults increases. However, as life expectancy increases above 70 years the effect of the young-adult share becomes negative. This might indicate that increasing length of education in low-mortality populations reduces the income-boosting effect of young adults.

A surprising result is that in high- and medium-mortality populations (life expectancy < 65 years) there is an effect on per capita income of young middle-aged adults (30-49 years) almost as negative as the effects of children. When life expectancy increases above 70 years, however, the effect of a high share of people in the total population aged 30-49 years becomes a strong booster of per capita income. A negative effect of prime-aged adults seems counterintuitive but there are, at least, two possible substantive explanations. One is that adults aged 30-49 are the primary caretakers of dependent children. Since most high- and medium-mortality populations still have high fertility rates this age group, therefore, may face severe time restrictions with respect to their participation in market activities. A second possibility is given by the fact that a high share of young middle-aged adults in populations with moderate and low life expectancy is associated with increased risk for severe disturbances to the social order like revolts, riots and civil war. It remains far from clear what lies behind this association but the existence of such a pattern would explain why a high share of people aged 30-49 does not give rise to the expected positive effects on per capita income. However, we cannot at this point ignore the possibility that it is simply a statistical artefact due to the high negative correlation between this group and the age share of children.

The 50-64 group follows a similar but less pronounced pattern. A weak negative effect when life expectancy at birth is around 60 turns to a positive one when life expectancy increases above 75 years.

For the old-age share the effect is negative but the estimated parameters are small. To some extent this reflects the use of shares expressed as logs. In populations with few old-age people small percentage-point increases in the old-age share translate into large increases in log shares.

One way to summarize these findings is to note that at low and medium levels of life expectancy the age effects on per capita income are dominated by the balance between children and young adults. Child-rich populations tend to be poor whereas countries with declining child dependency and an expanding young adult population enjoy rising per capita income. At higher levels of life expectancy it is instead a high share of middle-age adults (30-49 and 50-64 years old) that ensure good economic prospects. The hypothesis that changing life expectancy can alter the profile of age-structure effects has, thus, been corroborated.

Table 1 does not give the estimated country effects. These are displayed in Figure 5 which shows that a substantial part of the variation in per capita income is captured by the country effects. These strong country effects underscore the point that demography is not the only factor that determines per capita income. However, the capacity of demographic transition theory to predict mortality and fertility change in the post-World War II period gives us strong reasons to believe that population forecasts based on the transition hypothesis are relatively reliable. Therefore, a forecast of future changes in per capita income based on the model presented here can provide a picture of possible global trends that are consistent with historical correlations between demographic and economic change.

### *3.2. Forecasts*

Below the 2000-2050 forecasts per capita income for 13 different countries are presented (Figures 6a and 6b). These forecasts are all based on the medium variant of *World Population Prospects – The 2000 Revision*. According to the Population Division mortality in the medium version is projected on the basis of the models of change of life expectancy produced by the United Nations. In countries highly affected by the HIV/AIDS epidemic, estimates of the impact of the disease are made explicitly through assumptions about the future course of the epidemic, that is, by projecting the yearly incidence of HIV infection.

Figure 5
Fixed country effects on log per capita income by world region

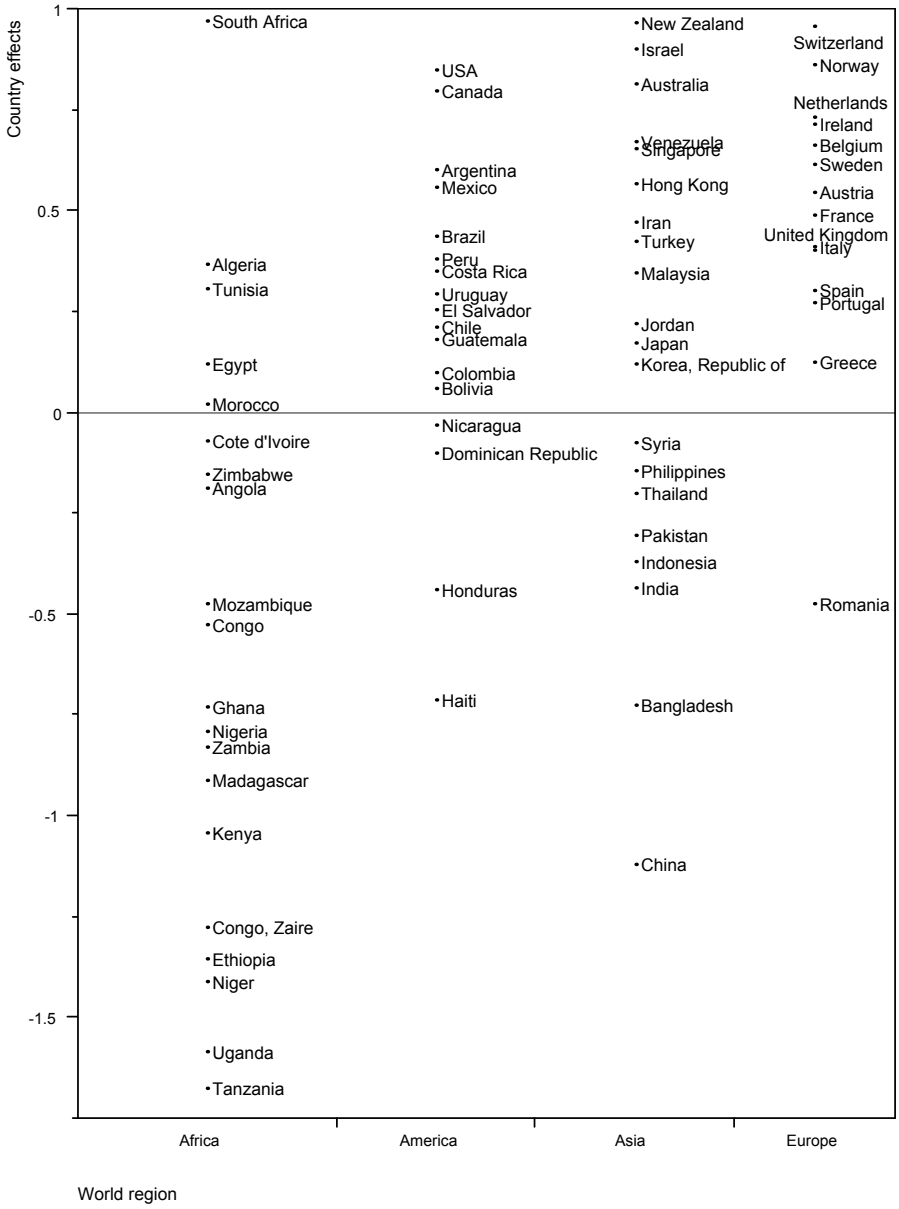


Figure 6a
Population-based forecast of per capita income 2000-2050, selected countries

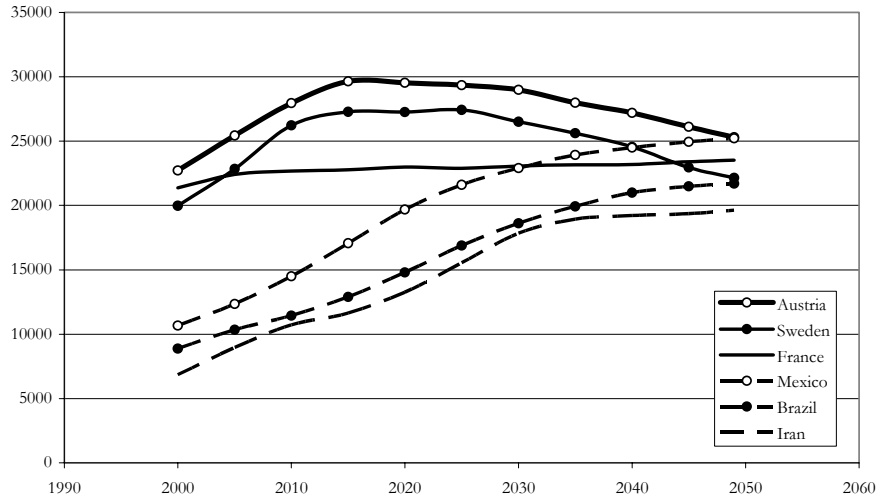
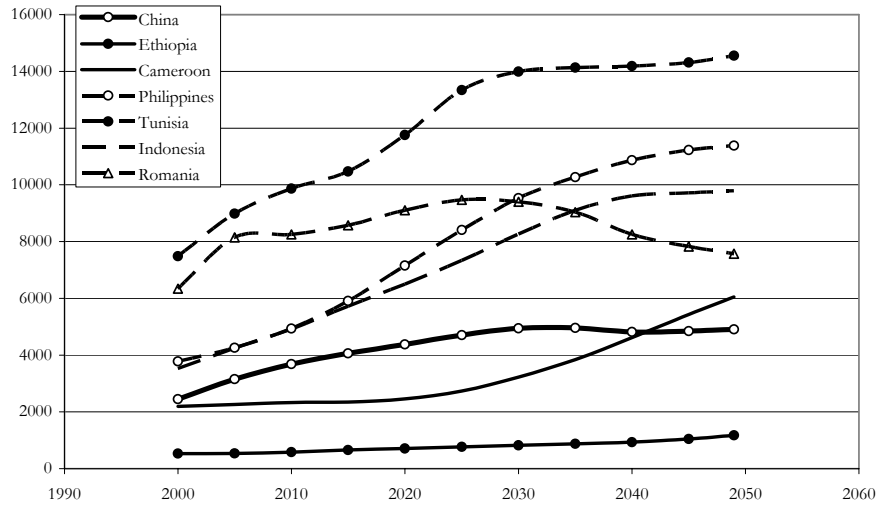



Figure 6b
Population-based forecast of per capita income 2000-2050, selected countries



The Population Division provides predicted values for the variable "population in the largest city" only up to 2015. Because of this the forecast we present below is based on a separate projection. This projection is based on an interpolation of observed country-specific growth rates for the population in the largest city. This observed growth rate has been adjusted for effects on the growth rate from shifts in the growth rate of the 0-14 age group, the 50-64 age group and the share of the 0-14 age group as well as allowing for a time-trend in the growth rates for the population of the largest city.

One characteristic of the forecasts is that they are not based on the assumption of a given rate of technological change. One reason for this is that the 1960-1998 period did not demonstrate a clear trend across all countries. We have, therefore, chosen to present forecasts without the addition of a technology trend.

These forecasts have been produced for 82 countries. Countries for which no forecast have been made are either not included in our original sample or do not have values available for the size of their largest city in UN's urbanization prospects.

The parameter values used in the forecast are those that are presented in Table 1 and Figure 5. One important modification, however, is that in the forecast the maximum value of life expectancy has been fixed to 76 years. The motivation for this is that in the sample used for estimating the model only a few countries have experienced life expectancies above 76 years for an extended period. As a consequence, there is no information about how increased life expectancies beyond 76 years will affect economic growth. In the forecast we present, this lack of knowledge is represented by an assumption that countries with a life expectancy above 76 years will behave in a way similar to countries that have only a life expectancy of 76 years.

The general pattern that developed countries will tend to stagnate while developing countries will tend to take off on a growth path is confirmed. The exceptions are mainly in sub-Saharan Africa and due to the AIDS epidemic and continuing high fertility in the UN forecast.

## 4. Conclusion: A Better World

Using demographic projections we evaluate forecasting models for GDP per capita based on demographic information. The result is that

the currently ageing developed countries will experience a stagnating or even negative growth trend in income. Most developing countries will, however, experience accelerating growth and converge towards the income levels of the developed world. The main exceptions to this are to be found in sub-Saharan Africa where the impact of AIDS on the age distribution is expected to postpone any growth take-off.

Thus we expect that demographic change and the demographic bonus following from decreased fertility rates will substantially decrease the share of people living in extreme poverty in the world. The negative aging effects on developed countries do not imply any catastrophic decrease of living standards. The future scenario that appears from this forecasting exercise is thus a rather bright one, where economic prosperity and equality increase and fewer people will live in extreme poverty. In the absence of contrary evidence we therefore find that demographic projections indicate a better world within the next half century.

**References**

BARCLAY, G W, COALE, A J *et al.* (1976) "A Reassessment of the Demography of Traditional Rural China", *Population Index*, 42(4): 606-635.

BLOOM, D E and WILLIAMSON, J G (1997) *Demographic Transitions and Economic Miracles in Emerging Asia*, National Bureau of Economic Reseach.

BLOOM, D E, CANNING, D *et al.* (2003) *The Demographic Dividend: A New Perspective on the Economic Consequences of Population Change*, Santa Monica, Calif., Rand.

CHESNAIS, J-C (1990) "Demographic-Transition Patterns and Their Impact on the Age Structure", *Population and Development Review*, 16(2): 327-336.

CHESNAIS, J-C (1992) *The Demographic Transition: Stages, Patterns, and Economic Implications: A Longitudinal Study of Sixty-seven Countries Covering the Period 1720-1984*, Oxford [England], Oxford University Press.

COOPER, I and KAPLANIS, E (1994) "Home Bias in Equity Portfolios, Inflation Hedging, and International Capital Market Equilibrium", *Review of Financial Studies*, 7(1): 45-60.

DAVIS, K (1956) "The Amazing Decline of Mortality in Underdeveloped Areas", *The American Economic Review*, 46(2): 305-318.

EHRLICH, P R (1968) *The Population Bomb*, New York.

EHRLICH, P R and EHRLICH, A H (1970) *Population, Resources, Environment: Issues in Human Ecology*, San Francisco, W.H. Freeman.

HIGGINS, M and WILLIAMSON, J G (1997) "Age Structure Dynamics in Asia and Dependence on Foreign Capital", *Population and Development Review*, 23(2): 261-293.

KELLEY, A C and SCHMIDT, R M (1995) *Saving, Dependency and Development*, Duke University, Department of Economics, Working Paper No. 95-01.

LINDH, T and MALMBERG, B (1999) "Age Structure Effects and Growth in the OECD, 1950-1990", *Journal of Population Economics*, 12: 431-449.

MALMBERG, B (1994) "Age Structure Effect on Economic Growth: Swedish Evidence", *Scandinavian Economic History Review*, 42: 279-295.

MALMBERG, B and SOMMESTAD, L (2000a) "The Hidden Pulse of History: Age Transition and Economic Change in Sweden, 1820-2000", *Scandinavian Journal of History*, 25 (1/2): 131-146.

MALMBERG, B and SOMMESTAD, L (2000b) *Heavy Trends in Global Developments*, Working Paper 2000:1, Stockholm, Institute for Futures Studies.

STOLNITZ, G J (1965) "Recent Mortality Trends in Latin America, Asia and Africa: Review and Re-interpretation", *Population Studies*, 19(2): 117-138.

TAEUBER, I B (1945) "The Demographic Statistics of Southern and Eastern Asia", *Journal of the American Statistical Association*, 40(229): 29-37.

TOPPOZADA, H K (1968) "Progress and Problems of Family Planning in the United Arab Republic" (in Part II. Fertility Control Programs in Africa and the Near East), *Demography*, 5(2): 590-597.

UNITED NATIONS. DEPT. OF ECONOMIC AND SOCIAL AFFAIRS (1963) *World Population Prospects*, New York, United Nations.

UNITED NATIONS (2001) *World Population Prospects – The 2000 Revision*, File 1: Total Fertility by Major Area, Region and Country, 1950-2050 (number of children per woman); File 3: Crude Birth Rate by Major Area, Region and Country, 1950-2050 (per 1,000); File 7: Crude Death Rate by Major Area, Region and Country, 1950-2050 (per 1,000), UN Population Division, Department of Economic and Social Affairs.

VAN DE WALLE, E and PAGE, H (1969) "Some New Estimates of Fertility and Mortality in Africa", *Population Index*, 35(1): 3-17.

WORLD BANK (2001) "Mortality", *World Development Indicators*: 114-117.

# 4

# IS PROGRESS IN EDUCATION SUSTAINABLE?

**Anne GOUJON**[1]

***Abstract***

Projections of educational attainment are complementary to projections of enrolment. They allow the translation of projections of enrolment rates into levels of educational attainment. Population projections by level of education allow us to have a precise knowledge not only about the combined momentum of population growth and the spread of education but also on the actual number of in-school or potentially in-school population by levels of education, all according to some interesting scenarios. This paper shows an application of educational attainment projections at the level of thirteen world regions. It shows the challenges that will face governments and international organizations because of increases in the sizes of school-age populations and increases in enrolment rates. On the contrary, for those regions that are already very advanced in the demographic transition and education levels, the task of maintaining enrolment rates or even increasing them will not be so daunting.

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## 1. Introduction

Education is thought more and more to be one of the main instruments in achieving the development objectives set by international organizations to reduce misery and poverty. This was particularly highlighted at the International Conference on Population and Development (ICPD, Cairo, 1994), but also in the Millennium Development Goals (MDG) where targets are set to increase completion of the primary cycle, to reduce illiteracy of the younger cohorts (15-24) and to remove the gaps existing between male and female enrolment at all levels of the education scheme. Empirical experience substantiates this view that social development that emphasizes direct action in fields such as public health, education and literacy, and social security contribute to better quality of life (e.g. Caldwell 1982; Bongaarts 2002). In this framework where planning for increasing access to education is of paramount importance, knowledge about the stock and flows of future students and the resulting composition of the adult population (also in terms of stock and flows) are crucial. This information is best obtained by conducting population projections by levels of education following the standard cohort-component method of population projections that can be modified in order to enable the projections of population not only by age and sex but also by the level of educational attainment. Those projections provide a useful tool to gain information on the level of educational attainment at any level of schooling desired, and for any chosen age groups. We show for instance in this paper possible applications to thirteen world regions.

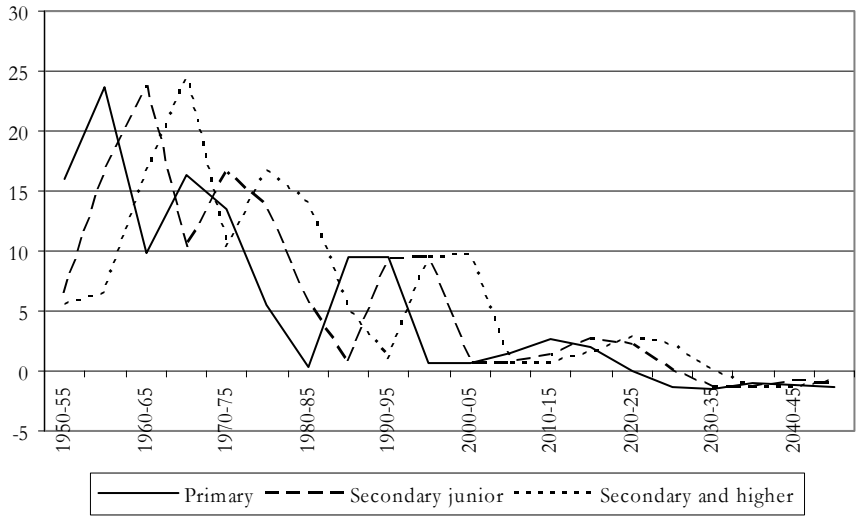
This in return provides useful insights on the future human-capital composition of the area (especially in comparison with others), on the potential impact of education on the fertility of the area, on the chances of certain social behaviour to appear or not, like use of modern contraceptives or participation in the labour force because education is a good proxy for many variables, as well as on the chances for economic growth. These projections of educational attainment are complementary to projections of enrolment. They give somehow the translation of projections of enrolment rates into educational levels of attainment.

The main contributions of the projections by levels of education are twofold. First, they reflect and demonstrate the combined momentum of education and population trends. Because planning for educa-

tion was and continues to be almost exclusively focussed on the educational sector (see UNESCO enrolment projections), educational planners rarely look beyond this sector with the view to assessing the implications of their plans for other sectors or the society at large. In particular, assessments of the implications of different educational policies for the educational attainment of the population have not been part of routine educational planning. This is unusual since the ultimate objective of education is increasing the skills and knowledge of the individuals of the society (Macura 1989). There is a long lag between the implementation of a policy (to increase enrolment at a particular level for instance) and the translation of this policy into higher skilled human capital. In fact, it takes at least half a century for the entire labour force to benefit from a policy implemented in primary school for instance. Information on the diffusion of education is very valuable if it is coupled with information on the age structure, showing for instance the comparative advantage of countries depending on dependency ratios and educational attainment of the working-age population.

The second important contribution of those projections is more classic in the sense that it allows to look into the stock of children to be enrolled, in a more systematic way since the output include the changes in age structure. The objectives of international organizations are often set in terms of proportions of children to be enrolled at a particular level, e.g. enrol all children in primary school by 2015, which of course in a growing population will mean a substantial increase in the number of children to be enrolled by many countries, even if no further improvements in education were to be implemented. The implementation of objectives such as education for all will raise the number of students even more. In that particular context will the age wave be of up most importance, creating larger or smaller cohorts at the age of being educated. A quick look at the estimated and projected growth rates between 1950 and 2050 of age groups 5-9, 10-14, and 15-19 from 1950 to 2050 (United Nations 2002), corresponding approximately to ages of enrolment in primary, junior secondary, secondary and tertiary education in large regions of the world, show that the larger increases in the size of the population to be educated at the different levels are already of the past and occurred in the 1960-70s in less developing regions. Figure 1, whose pattern can almost be generalized for all separate developing regions, shows that later waves will most likely be of lesser importance, although quite strong. This of course does not mean

Figure 1
Five-year period growth rates (%) of age group 5-9 (primary school age), 10-14 (junior secondary school age), and 15-19 (secondary and higher school age) for less developed countries




Source: United Nations 2002.

that there are less people to be educated, as we will see in the projections that follow. Indeed the challenges will be daunting for some areas of the world. For others, essentially most developed countries, the demand for education will be decreasing dramatically. Hence the projections reflect the momentum of education and population trends, and include the changes in age structure.

To summarize, the projections of levels of educational attainment are useful in quantifying and qualifying the changes that will occur to the age structure in the future as will be demonstrated for the thirteen regions. This paper is based on a study conducted together with Wolfgang Lutz (Lutz and Goujon 2001; Goujon and Lutz 2004).

## 2. Methodology

The multi-state population projection methods allow the population to be divided into any number of "states", which have traditionally

been geographic regions (Rogers 1975) but could also be educational categories. The demographic method of cohort-component projection is in fact most appropriate to educational projections since education is typically acquired in childhood and youth, and the educational composition of the population then changes along cohort lines.

## 3. An Example of World Regions

This section of the chapter is based on global population projections by educational attainment for 13 world regions (1- Central Asia, 2- China and Centrally Planned Asia, 3- Eastern Europe, 4- Former Soviet Union, 5- Latin America, 6- Middle East, 7- North Africa, 8- North America, 9- Pacific Asia, 10- Pacific OECD, 11- South Asia, 12- sub-Saharan Africa, 13- Western Europe) using multi-state population projection methods. The educational composition of the population by age, sex and educational fertility differentials are estimated, and alternative scenarios are presented to 2030. Detailed methodology and results can be found in Lutz and Goujon (2001) and Goujon and Lutz (2004). I present here results from two scenarios: the "constant" scenario[2] and the "ICPD" scenario[3] from 2000 to 2030. Special attention is paid to

2. The "Constant enrolment rates" scenario assumes that no improvements are made over time in the proportion of a young cohort that acquires different levels of education. Therefore, transition rates are held constant at their 2000 values. Fertility, mortality, and migration trends follow the IIASA (International Institute for Applied Systems Analysis) central scenario (Lutz and Goujon, 2001).

3. A number of specific goals were adapted in the "ICPD" scenario, which reflects the objectives described in the 1994 Cairo Conference Programme of Action:

- Eliminate the gender gap in primary and secondary school education by the period 2005-2010 (by 2005 in the Programme of Action).
- All girls and boys will have complete access to primary schooling before the period 2015-2020 (by 2015 in the Programme of Action).
- During the period 2010-2015, the net primary school enrolment ratio for children of both sexes will be 90% (by 2010 in the Programme of Action).
- Countries that have achieved the goal of universal primary education are urged to extend education and training, and to facilitate access to and completion of education at secondary school and higher levels by 2025-2030 (the Programme of Action does not specify any date).

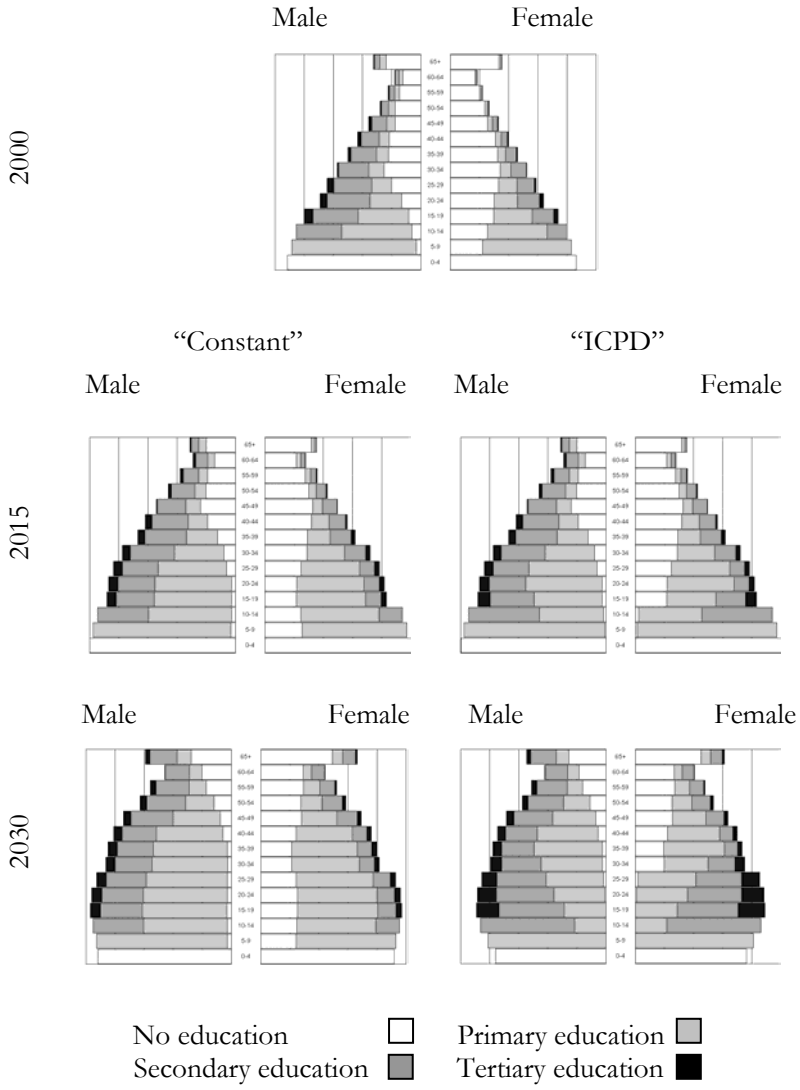
Two components were added here to the "ICPD" scenario. All developing countries will achieve 75% participation in secondary education for boys and girls by 2025-2030. The rates of enrolment in tertiary education will increase by 5% by projection

2015, which represents a crucial period for the MDG when most of the objectives should have been met. The population in each region is divided by age, sex and four education categories: no education, primary education, secondary education, and tertiary education. It is important to mention that the data provided give levels of educational attainment according to the international education classification (ISCED) without any information on the quality of the education acquired within a particular level. This may be a drawback in the analysis since we are comparing different regions of the world and it should be kept in mind through this paper. Another limitation, which has a genesis similar to the last one, is the data sources. Data for each region is built from individual country information and not all regions have a complete coverage of the countries within. The regional coverage was estimated at more than 95 per cent of the total population in 2000 for the China region, North America, Pacific Asia, Pacific OECD, and South Asia. The coverage was between 84 and 89 per cent for Central Asia, Eastern Europe, Former Soviet Union, Latin America, and Western Europe. In the three remaining regions, Middle East, North Africa and sub-Saharan Africa, the coverage was between 60 and 80 per cent.

Figure 2 gives the starting conditions in 2000 and the results of the two alternative scenarios in 2015 and 2030 for the region of South Asia. It is given in the form of multi-state age pyramids for women in five-year age groups on the right and men on the left, with the shading referring to different levels of educational attainment. The improvements in schooling over the past 20 years are clearly visible in the form of smaller numbers without formal education in the younger cohorts. This improvement in South Asia, however, was much more pronounced for men than for women, and today this strong gender gap in education still exists. The longer-term implications of this are visible in the pyramid, which gives the results of the "constant" scenario. Due to past declines and anticipated future declines in total fertility, the population of South Asia is expected to age: the youngest cohorts will no longer be larger than the preceding ones; the mean age of the population will increase; and the population aged above 65 will double in the next 30 years. In terms of education, the pattern reflects the gender bias in the current South Asian educational system. In contrast, the

period in all regions, except in the North American region, where transitions to this level are already above 50% for both sexes.

Figure 2
Age and education pyramids for South Asia in 2000, 2015 and 2030 according to "constant" and "ICPD" scenarios (in thousand)




Source: Author's calculation.

"ICPD" scenario shows another possible future. This would significantly increase the educational attainment of the South Asian population below age 30 and narrow the educational gender gap. But the older labour force will not be affected by 2030, and even less by 2015. This illustrates the slow speed at which recent and current investments in education will affect the composition of the total population.

In global comparative analysis (see appendix Table 1), some regions are likely to see stunning progress even in the case of the "constant" scenario. Most impressive is China, where the proportion of women aged above 15 with secondary education would increase from 35% in 2000, to 49% in 2015 and to 60% in 2030, and that of men from 51% to 63% and 71% respectively. In North Africa and the Middle East, the proportion of women with secondary education would increase from 20% and 23% respectively in 2000 to 30% and 32% in 2015 and 35% and 37% in 2030. These expected improvements are a direct consequence of past investments in female education. In sub-Saharan Africa, only minor improvements of the educational attainment can be expected due to this compositional effect, for the younger generations have similar levels of education as the older generations. Therefore, the "constant" scenario shows very little improvements in the educational composition of the adult population. In fact, in a number of African countries, recent declines in school enrolment rates even imply a deterioration of the educational composition in the longer term.

On a global level, the "constant" scenario implies that in 2030, one out of five women above age 15 will still be without any formal education and will be mostly illiterate. For men, this percentage is only 8%. It is worth noting that in 2015, the educational composition of the population does not differ significantly between the "ICPD" and the "constant" scenarios, pointing again to the slow translation of the improvements in school enrolment into educational attainment at the work-force ages. Under the "ICPD" scenario, which puts emphasis on rapid steps toward universal primary education, 7% of the world's male population above age 15 and 14% of the world's women would still be uneducated in 2030. This slow improvement at the lower educational end and in the closure of the gender gap of the adult population is again due to the great inertia of the educational composition factor. The results of efforts become visible more quickly for secondary education in the "ICPD" scenario: in 2000, 42% of men and 32% of

women had some secondary education; in 2030 this will be respectively 51% and 44%, according to the "ICPD" scenario. Also, while currently 8% of all women and 11% of all men in the world have some form of tertiary education, by 2030 this would increase to only 12% and 10%, respectively, under the "constant" scenario, and to 13% and 12%, respectively, under the "ICPD" scenario.

In the same way that MDRs will have a lower share of the world population in the future than will LDRs, the human capital of the planet will be concentrated in LDRs. Whereas 77% of the working-age population (age group 20-64) lived in LDRs in 2000, this figure will be 84% by 2030, regardless of the scenario. The levels of educational attainment will be crucial to the development of these regions (Table 1). The "constant" scenario shows what the educational structure would be if all future cohorts adopted the enrolment rates of today. In that case, two major changes would occur in the educational composition of LDRs: (i) a decline of illiteracy from one third of the working-age population of LDRs to 14% (8% for men and 20% for women) in 2030; and (ii) a strong increase in the share of the population with a secondary education, from 38% to 47% for males and from 26% to 38% for females in 2030. Because of the longer implementation time of higher education in MDRs, changes will not be as drastic under the two scenarios envisioned. The "constant" scenario shows a slight increase in the proportion of the population with a higher education (secondary and tertiary combined) and a proportional decrease in the proportion with a primary education.

The changing educational composition of the population is significant not only for individual development and a nation's institutional and economic performance, but also for the relative weights, productivity, and competitiveness of major world markets. In this context it is useful to look at absolute numbers of workers by skill level rather than at the proportions. Figure 3 compares four of the economic mega-regions of the future (Europe and North America combined, China, South Asia, and sub-Saharan Africa) in terms of trends in the size of the working-age population (aged 20-64) by educational attainment. The data presented is taken from the "ICPD" scenario. This scenario reflects the quantitative objectives concerning education proposed by the International Conference on Population and Development (ICPD) held in Cairo in 1994. These were mainly related to the spread of education to the population of developing countries, especially to girls,

Table 1
Share of the working-age population aged 20-64 by level of educational attainment according to two scenarios in More Developed Regions (MDR) and Less Developed Regions (LDR), 2000, 2015, and 2030

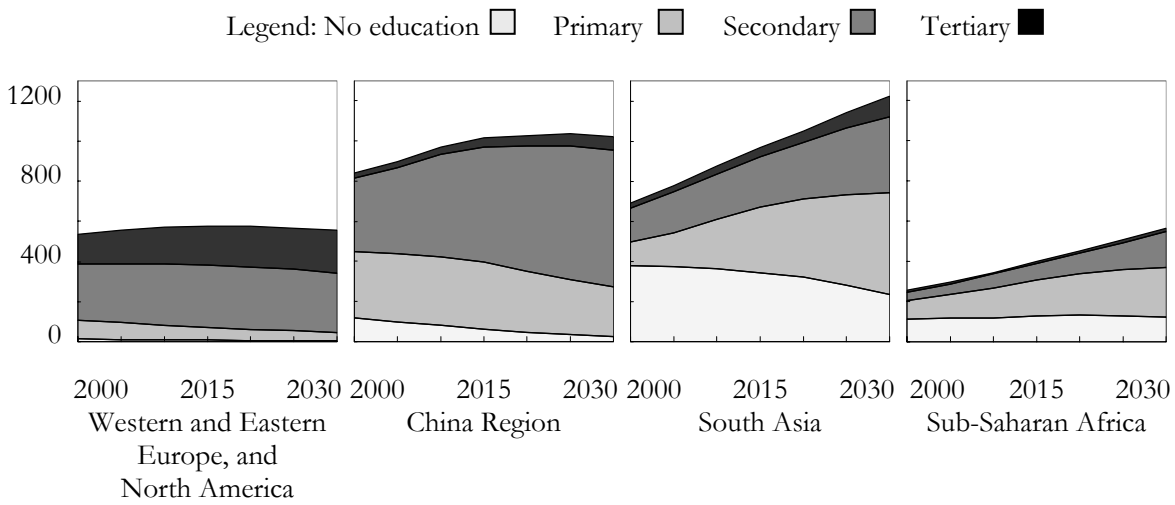
| | | 2000 | | 2015 – Scenario: | | | | 2030 – Scenario: | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | "Constant" | | "ICPD" | | "Constant" | | "ICPD" | |
| Education | Sex | MDR | LDR | MDR | LDR | MDR | LDR | MDR | LDR | MDR | LDR |
| No education | M | 1.5 | 23.0 | 0.8 | 13.5 | 0.8 | 13.5 | 0.7 | 8.2 | 0.7 | 7.5 |
| | F | 2.3 | 39.2 | 1.2 | 26.8 | 1.2 | 26.8 | 0.8 | 20.0 | 0.8 | 16.2 |
| Primary | M | 16.5 | 32.1 | 10.5 | 34.7 | 10.5 | 35.0 | 7.8 | 37.4 | 7.3 | 34.6 |
| | F | 19.0 | 30.9 | 11.4 | 34.6 | 11.4 | 34.9 | 7.8 | 36.6 | 7.3 | 34.3 |
| Secondary | M | 54.8 | 38.3 | 58.1 | 44.7 | 58.0 | 44.4 | 59.3 | 46.7 | 58.6 | 48.9 |
| | F | 53.7 | 25.8 | 56.5 | 33.7 | 56.4 | 33.4 | 57.0 | 37.8 | 56.2 | 42.0 |
| Tertiary | M | 27.2 | 6.6 | 30.6 | 7.1 | 30.7 | 7.2 | 32.2 | 7.6 | 33.4 | 9.0 |
| | F | 25.0 | 4.1 | 30.9 | 4.9 | 31.1 | 5.0 | 34.4 | 5.6 | 35.7 | 7.5 |

Source: Author's calculation.

which included goals of enforcing universal access to quality education, with particular priority given to primary education, of combating illiteracy, and of eliminating gender disparities in access to education.

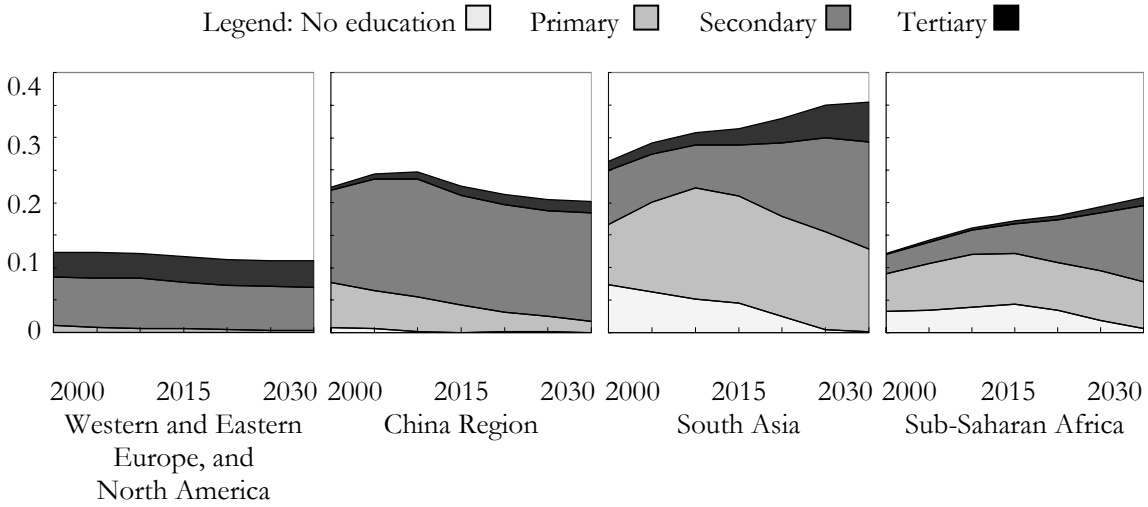
Currently China clearly has the largest total working-age population of these four regions, but its educated population (secondary and tertiary combined) is still smaller than that of Europe-North America. In terms of the educated working-age population, South Asia is far behind, with less than half the size of Europe-North America and China. Over the next 20 years, South Asia is expected to surpass China in terms of total size of the working-age population. But in terms of the educational composition of the population, the difference between the two regions will be stunning. While in China in 2030, 73% of the working-age population will be better educated (secondary plus tertiary), in South Asia only 40% will be. The main reason for this divergence lies in the differences in investment in primary and secondary education over the last two decades between the two regions. Of the four major world regions, Europe-North America will continue to have the highest educational levels in its working-age population, but in terms of absolute numbers of educated people, it will clearly fall behind China. Over the next three decades, China's educated working-

Figure 3
Population aged 20-64 years (in millions) by level of education,
according to the "ICPD" scenario in four mega-regions, 2000-2030




Source: Author's calculation.

Figure 4
Population aged 15-24 years (in millions) by level of education,
according to the "ICPD" scenario in four mega-regions, 2000-2030




Source: Author's calculation.

age population is likely to increase from 390 million to 750 million, while that of Europe (without the former Soviet Union) and North America combined will hardly increase, from 430 million to 510 million in 2030. These significant future changes in the numbers of skilled workers are likely to have far-reaching consequences for the weights in the global economic system.

In sub-Saharan Africa, low human capital associated with enormous pressure on the educational system poses significant limits to the prospects for social and economic development in the nearer term. In 2000, only 19% of the population in the 20-64 age group had a secondary education or higher. In 2015, this percentage will only have slightly increased to 21%. This shows how sub-Saharan Africa is far from converging to other regions' levels of educational attainment, even if according to the "ICPD" scenario, this percentage will rise to 35% in 2030.

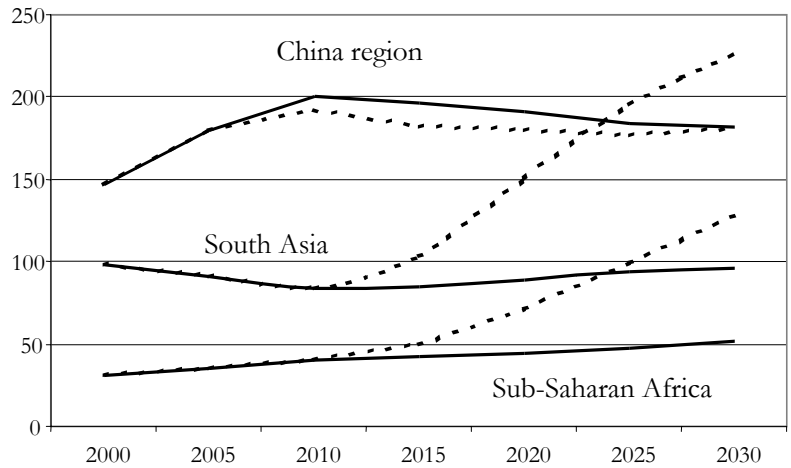
These results also indicate that financial investments in the education system will need to be raised substantially to cover the increase in enrolment rates and the increase in population size at the key educational ages in developing countries. Population growth by age remains the single most important factor in determining the long-term growth of demand for educational services. Table 2 shows the absolute numbers of population aged 15-24 with a higher education (secondary and tertiary combined) from 2000 to 2030 according to the "constant" and "ICPD" scenarios. Figure 5 illustrates the same for a few regions. It shows that even if all regions keep the levels of enrolment at the present rate, the number of pupils to enter an institution of higher education will increase substantially in sub-Saharan Africa, in the Middle East, in Central and South Asia, as well as in the China region. The latter region will face enormous tension in the educational system, as almost 50 million students more will seek higher education in 2015 than in 2000 – an increase of 40%. However, after 2010-2015, the school population will stabilize and even modest economic growth could therefore ensure rising levels of expenditure per student. The problems will be more acute in the South Asian and sub-Saharan African regions where national revenue levels are lower than in the China region. In sub-Saharan Africa, the school-age population is growing at an annual rate of 3 per cent in 2000-2005. The projections show that the annual rate of growth of the school-age population will diminish steadily until 2010-2015, when it will rise again until 2025-2030 and this

Table 2
Population (millions) in the 15-24 age group with secondary or tertiary education, according to "constant" and "ICPD" scenarios, in 2000, 2015, and 2030

| Regions | | "Constant" scenario | | "ICPD" scenario | |
|---|---|---|---|---|---|
| Year | 2000 | 2015 | 2030 | 2015 | 2030 |
| North Africa | 19.9 | 22.2 | 24.6 | 22.5 | 31.8 |
| Sub-Saharan Africa | 31.4 | 42.6 | 51.3 | 50.0 | 128.4 |
| North America | 41.1 | 44.4 | 43.7 | 44.5 | 44.5 |
| Latin America | 65.3 | 70.2 | 74.3 | 71.3 | 81.9 |
| Central Asia | 10.5 | 12.3 | 14.5 | 12.3 | 14.7 |
| Middle East | 16.7 | 24.5 | 30.4 | 25.3 | 39.7 |
| South Asia | 98.2 | 85.0 | 95.6 | 103.5 | 225.8 |
| China Region | 146.9 | 195.9 | 181.4 | 181.9 | 184.7 |
| Pacific Asia | 44.7 | 46.2 | 50.2 | 48.6 | 68.9 |
| Pacific OECD | 18.5 | 15.2 | 14.8 | 15.3 | 15.1 |
| Western Europe | 54.9 | 54.2 | 49.1 | 54.3 | 49.9 |
| Eastern Europe | 16.7 | 11.8 | 11.4 | 12.0 | 12.6 |
| Former Soviet Union | 33.0 | 22.4 | 22.6 | 22.6 | 24.3 |

Source: Author's calculation.

Figure 5
Population aged 15-24 (millions) with secondary or tertiary education, according to "constant" and "ICPD" scenarios in three regions, 2000-2030




Legend: "Constant" scenario ———— "ICPD" scenario - - - - - - - -

Source: Author's calculation.

occurs in all of the regions plotted on the Figures 3 and 4. In countries where the growth rate of the school-age group exceeds the rate of economic growth, it is clear that to maintain current enrolment ratios, ever-larger proportions of central government expenditures will have to be allocated to financing education. On the contrary, Table 2 shows that MDRs will face a decline of the absolute numbers of students entering higher education as a result of population decline.

## 4. Conclusions

Our projections and pyramids convey a mixed message. Although they depict considerable educational progress between 2000 and 2030 in all selected regions, they also reveal that the legacy of many countries past neglect of education is still clearly visible in the form of low-level education within the next 30 years. Our scenarios with high improvements (Cairo ICPD education objective for world regions) are not sufficient to remove this legacy. The results indicate the inertia with which investments in education permeate through the population. The results also have age-specific implications. They demonstrate that there is much scope for school-age cohorts to enjoy immediate benefits from near-term schooling improvements, in the form of higher educational levels. However, the pyramids also show ageing of the working-age populations, so that increasing proportions of them have already completed their school-age years and will not benefit from such improvements. For this age group, our results therefore indicate the increasing importance of adult educational campaigns in improving educational standards. The pyramids also reveal the growth of elderly, particularly female, populations, with considerable room for educational improvements, strengthening the case for adult education. As well, the scenarios show that the school-age population, and especially the population enrolled in secondary and tertiary education will increase dramatically in the next 30 years. This is particularly true in sub-Saharan Africa, where low human capital associated with enormous pressure on the education system significantly limits the prospects for social and economic development in the nearer term.

**References**

BONGAARTS, John (2002) "The End of the Fertility Transition in the Developed World", *Population and Development Review*, 28(3): 419-443.

CALDWELL, J C (1982) *Theory of Fertility Decline*, New York: Academic Press.

GEMMELL, Norman (1996) "Evaluating the Impacts of Human Capital Stocks and Accumulation on Economic Growth: Some New Evidence", *Oxford Bulletin of Economics and Statistics*, 58(1): 9-28.

GOUJON, Anne and LUTZ, Wolfgang (2004) "Future Human Capital: Population Projections by Level of Education", in Lutz, Wolfgang and Sanderson, Warren (eds), *The End of Population Growth*, Earthscan: 121-157.

LUTZ, Wolfgang and GOUJON, Anne (2001) "The World's Changing Human Capital Stock: Multi-state Population Projections by Educational Attainment", *Population and Development Review*, 27(2): 323-339.

MACURA, Miroslav (1989) "Methods to Project Enrolment by School Level and Population by Level of Education", in IUSSP, *International Population Conference, New Delhi, September 20-27, 1989*, Liège, Belgium: International Union for the Scientific Study of Population, Vol. 3: 23-39.

ROGERS, Andrei (1975) *Introduction to Multiregional Mathematical Demography*, New York, NY: John Wiley.

UNITED NATIONS (2002) *World Population Prospects: The 2002 Revision*, New York, NY: United Nations Population Division.

WILS, Annababette and GOUJON, Anne (1998) "Diffusion of Education in Six World Regions, 1960-1990", *Population and Development Review*, 24(2): 357-368.

Appendix Table 1
Share of population above 15 years of age by education (in percentages) and by sex
according to "constant" and "ICPD" scenarios, in 2000, 2015 and 2030 ('M' stands for male and 'F' for female)

| Regions | 2000 | | | | | | | | 2015 – Scenario "constant" | | | | | | | | 2015 – Scenario "ICPD" | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No educ. | | Primary | | Secondary | | Tertiary | | No educ. | | Primary | | Secondary | | Tertiary | | No educ. | | Primary | | Secondary | | Tertiary | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| North Africa | 33 | 55 | 21 | 17 | 32 | 20 | 15 | 8 | 21 | 42 | 25 | 19 | 40 | 30 | 15 | 9 | 21 | 42 | 25 | 19 | 39 | 30 | 15 | 9 |
| Sub-Saharan Africa | 33 | 52 | 42 | 34 | 21 | 12 | 3 | 1 | 24 | 41 | 49 | 41 | 24 | 17 | 3 | 1 | 24 | 41 | 47 | 40 | 26 | 18 | 3 | 1 |
| North America | 1 | 1 | 7 | 7 | 49 | 51 | 44 | 42 | 1 | 1 | 6 | 6 | 49 | 49 | 45 | 45 | 1 | 1 | 6 | 6 | 49 | 49 | 45 | 45 |
| Latin America | 12 | 15 | 39 | 39 | 39 | 37 | 11 | 9 | 6 | 8 | 37 | 37 | 47 | 45 | 11 | 10 | 6 | 8 | 36 | 37 | 47 | 45 | 11 | 11 |
| Central Asia | 1 | 4 | 4 | 7 | 77 | 77 | 17 | 13 | 0 | 1 | 2 | 2 | 82 | 84 | 16 | 13 | 0 | 1 | 1 | 2 | 82 | 83 | 16 | 13 |
| Middle East | 19 | 34 | 39 | 33 | 29 | 23 | 14 | 10 | 12 | 28 | 36 | 30 | 39 | 32 | 12 | 9 | 12 | 28 | 35 | 30 | 39 | 32 | 13 | 9 |
| South Asia | 39 | 66 | 23 | 17 | 32 | 15 | 5 | 2 | 22 | 48 | 38 | 33 | 33 | 15 | 6 | 3 | 22 | 48 | 37 | 31 | 34 | 17 | 7 | 4 |
| China Region | 10 | 26 | 36 | 37 | 51 | 35 | 4 | 2 | 4 | 13 | 28 | 34 | 63 | 49 | 5 | 3 | 4 | 13 | 30 | 35 | 61 | 48 | 5 | 3 |
| Pacific Asia | 23 | 33 | 37 | 36 | 31 | 24 | 9 | 6 | 15 | 22 | 40 | 40 | 36 | 31 | 10 | 7 | 15 | 22 | 39 | 40 | 36 | 31 | 10 | 8 |
| Pacific OECD | 0 | 0 | 19 | 22 | 54 | 55 | 26 | 23 | 0 | 0 | 13 | 15 | 59 | 60 | 28 | 25 | 0 | 0 | 13 | 15 | 58 | 60 | 28 | 25 |
| Western Europe | 5 | 8 | 23 | 28 | 53 | 49 | 19 | 15 | 3 | 5 | 16 | 20 | 56 | 52 | 26 | 23 | 3 | 5 | 16 | 20 | 55 | 52 | 26 | 24 |
| Eastern Europe | 2 | 3 | 30 | 39 | 58 | 49 | 10 | 8 | 1 | 1 | 21 | 27 | 68 | 61 | 11 | 10 | 1 | 1 | 21 | 27 | 68 | 61 | 11 | 10 |
| Former Soviet Union | 1 | 0 | 23 | 27 | 60 | 57 | 17 | 16 | 0 | 0 | 14 | 17 | 67 | 63 | 19 | 19 | 0 | 0 | 14 | 17 | 67 | 63 | 19 | 20 |
| World | 18 | 31 | 30 | 28 | 42 | 32 | 11 | 8 | 11 | 22 | 31 | 31 | 46 | 37 | 11 | 10 | 11 | 22 | 31 | 30 | 46 | 38 | 12 | 10 |

(cont.)

Appendix Table 1 (continued)

| Regions | 2030 – Scenario "constant" | | | | | | | | 2030 – Scenario "ICPD" | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No educ. | | Primary | | Secondary | | Tertiary | | No educ. | | Primary | | Secondary | | Tertiary | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| North Africa | 14 | 34 | 28 | 21 | 44 | 35 | 14 | 9 | 12 | 27 | 26 | 22 | 45 | 40 | 16 | 12 |
| Sub-Saharan Africa | 20 | 36 | 52 | 44 | 25 | 19 | 3 | 1 | 15 | 24 | 43 | 40 | 37 | 33 | 5 | 3 |
| North America | 1 | 1 | 6 | 6 | 49 | 47 | 44 | 46 | 1 | 1 | 6 | 5 | 49 | 47 | 44 | 47 |
| Latin America | 3 | 4 | 35 | 35 | 51 | 50 | 11 | 11 | 3 | 4 | 33 | 33 | 52 | 51 | 12 | 12 |
| Central Asia | 0 | 0 | 1 | 1 | 84 | 86 | 15 | 13 | 0 | 0 | 1 | 1 | 83 | 85 | 16 | 14 |
| Middle East | 10 | 25 | 35 | 29 | 44 | 37 | 11 | 9 | 8 | 17 | 32 | 30 | 47 | 42 | 13 | 11 |
| South Asia | 12 | 37 | 48 | 44 | 33 | 15 | 7 | 4 | 12 | 29 | 40 | 36 | 38 | 27 | 10 | 9 |
| China Region | 2 | 7 | 21 | 29 | 71 | 60 | 6 | 4 | 2 | 7 | 22 | 29 | 69 | 59 | 7 | 5 |
| Pacific Asia | 9 | 15 | 42 | 42 | 38 | 35 | 11 | 8 | 9 | 13 | 38 | 38 | 41 | 39 | 13 | 10 |
| Pacific OECD | 0 | 0 | 8 | 9 | 62 | 64 | 29 | 26 | 0 | 0 | 8 | 9 | 61 | 63 | 30 | 27 |
| Western Europe | 1 | 3 | 11 | 14 | 57 | 54 | 30 | 30 | 1 | 3 | 11 | 14 | 55 | 52 | 32 | 32 |
| Eastern Europe | 0 | 0 | 16 | 19 | 73 | 69 | 11 | 11 | 0 | 0 | 14 | 18 | 74 | 70 | 12 | 12 |
| Former Soviet Union | 0 | 0 | 10 | 11 | 71 | 68 | 19 | 21 | 0 | 0 | 8 | 10 | 71 | 68 | 20 | 22 |
| World | 8 | 18 | 33 | 32 | 48 | 40 | 12 | 10 | 7 | 14 | 29 | 29 | 51 | 44 | 13 | 12 |

# *Part II*

# *ANTICIPATING AND MANAGING WAVES: CASE STUDIES*

# 5

# CHANGEMENT DE STRUCTURE PAR ÂGE ET DÉVELOPPEMENT AU CAMEROUN

**Gervais BENINGUISSÉ**[1] **et Hamidou KONÉ**[2]

***Résumé***

Cet article examine l'évolution passée et future de la structure par âge de la population du Cameroun en mettant en évidence ses implications pour le développement économique et social. L'évolution passée est retracée à partir des données de recensements (1976 et 1987) et de l'Enquête Démographique et de Santé de 1998. L'évolution future est simulée sur un horizon temporel de 35 ans, avec comme base la structure de la population et les indicateurs démographiques de l'année 1998. Les prévisions sont faites suivant deux scénarios : en l'absence et en tenant compte de la pandémie du VIH/SIDA, dont la vitesse de propagation est sans précédent. D'après les résultats, l'évolution passée de la structure par âge est caractérisée par un malus démographique généré par un renforcement de la dépendance économique des inactifs sur les actifs, avec comme corollaire l'accroissement des besoins d'investissements sociaux au détriment des investissements économiques créateurs de richesse. En dépit des efforts consentis, la réponse économique et sociale de l'État n'a pas été à la hauteur des besoins inhérents au changement de structure par âge. En 1998, près d'un enfant de 6-14 ans sur trois n'était pas scolarisé, près d'une personne sur trois était au chômage et 64% des enfants de 12-23 mois n'étaient pas complètement vaccinés. L'avenir aurait pu être envisagé avec plus d'optimisme, puisqu'on postule l'émergence d'un modeste bonus démographique caractérisé par une diminution progressive de la proportion de la population jeune au profit d'une augmentation

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régulière de la population active et d'une baisse continue de la dépendance économique. Mais ce modeste bonus démographique pourrait être inhibé, contrebalancé ou précarisé par le VIH/SIDA et une réponse pronataliste à cette pandémie, dont la maîtrise est difficilement envisageable sur la période de projection 1998-2033. Dans ce contexte épidémiologique, il sera difficile d'atteindre les objectifs du millénaire pour le développement. Des défis majeurs interpellent les décideurs pour la mise en place de politiques adéquates dans les domaines de la santé, de l'éducation et de l'économie.

## 1. Introduction

Le Cameroun fait partie des 46 pays d'Afrique au Sud du Sahara qui ont entamé leur transition démographique. D'après les résultats d'enquêtes démographiques nationales, l'indice synthétique de fécondité y baisse en moyenne de 0,87 tous les 10 ans. Entre 1950-1955 et 1990-2000, la baisse de la mortalité a été spectaculaire, faisant passer l'espérance de vie de 36 ans à 50 ans, soit un gain de 15 ans en 45 ans environ (United Nations 2002). Les conséquences de telles évolutions sur la structure par âge de la population et l'économie du pays sont inéluctables. Au niveau de la structure par âge, la baisse de la fécondité réduit la proportion des enfants, tandis que celle de la mortalité prolonge l'espérance de vie. Au plan économique, cette évolution se traduit par une augmentation de la population économiquement active et une baisse de la dépendance économique des personnes inactives vis-à-vis des personnes actives, cette dernière étant fortement alimentée par la sous-population des enfants. Ces tendances déterminent les politiques de développement économique et social, notamment en matière de production et de création de richesses, de prise en charge des jeunes et des personnes âgées.

La poursuite de la baisse de la fécondité et de la mortalité aurait pu laisser entrevoir ce que d'aucuns ont appelé « bonus démographique » (Bloom *et al.* 2003) ou « fenêtre d'opportunité » (voir Wong et Carvalho, chapitre 7 du présent ouvrage), engendré par une prépondérance continue de la population économiquement active associée à une baisse continue de la dépendance économique des personnes inactives vis-à-vis des personnes actives. Mais l'émergence du VIH/SIDA et sa vitesse de propagation sans précédent pourraient remettre en question cet optimisme, tout au moins le tempérer sensiblement.

Ce chapitre tente de le démontrer en examinant l'évolution passée et future de la structure par âge de la population du Cameroun et ses implications pour le développement économique et social.

## 2. Évolution passée de la structure par âge de la population et ses implications pour le développement économique et social

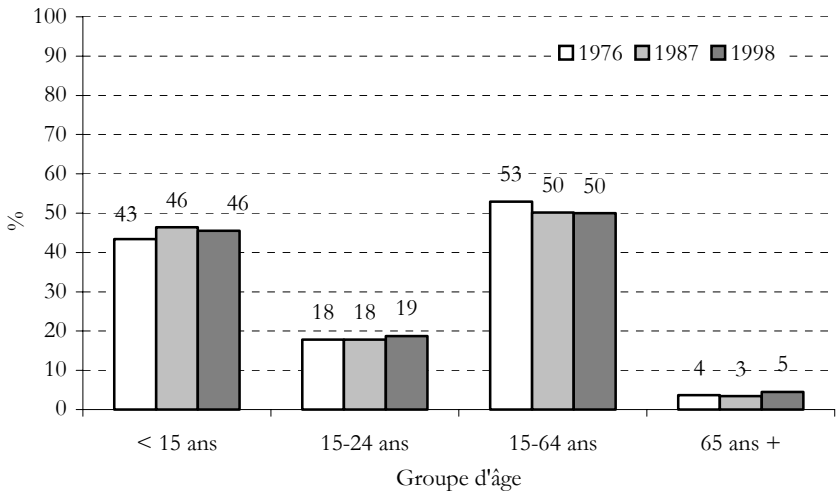
L'évolution passée de la structure par âge de la population du Cameroun est retracée à partir des données de recensements (1976 et 1987) et de l'Enquête Démographique et de Santé de 1998. D'après ces données, la population camerounaise est passée de plus de 7,5 millions en 1976 à 10,5 millions en 1987 et à 14,3 millions en 1998, soit une augmentation décennale moyenne de 37 %. Cette augmentation est en grande partie due à une forte croissance naturelle estimée à près de 3 %, résultante d'une mortalité en baisse continue et d'une fécondité toujours élevée malgré quelques signes de baisse. En effet, l'espérance de vie à la naissance est passé de 48 ans en 1976 à 51 ans en 1987 et à 55 ans 1998, tandis que l'indice synthétique de fécondité est passé de 6,7 à 5,8 et à 5,2 enfants par femme au cours des mêmes périodes respectivement. L'incidence de ces changements sur la structure par âge de la population a des implications politiques pour la population jeune, la population active et les personnes âgées.

### *2.1. Implications pour la population jeune*

La structure démographique du Cameroun est restée majoritairement jeune. La proportion de jeunes de moins de 15 ans est passée de 43 % en 1976 à 46 % en 1987 et 1998, soit une augmentation de trois points (figure 1). La proportion des jeunes enfants (moins de 5 ans) est passée de 17 % en 1976 à 18 % en 1987 tandis que celle des 5-14 ans est passée de 26 % à 28 % au cours de la même période. Cette augmentation est le résultat combiné d'une forte natalité et d'une baisse spectaculaire de la mortalité des jeunes et en particulier des enfants de moins de cinq ans, qui, d'après les données d'enquêtes démographiques nationales, est passée de 200 ‰ en 1976 à 165 ‰ en 1987. En 1998, la proportion des enfants de moins de cinq ans est retombée à 16 %, tandis que celle des 5-14 ans s'élevait à 30 %. La proportion des 15-24

ans a, quant à elle, peu varié entre 1976 et 1998, se stabilisant autour de 18 % (figure 1).

Figure 1
Structure par âge de la population du Cameroun en 1976, 1987 et 1998



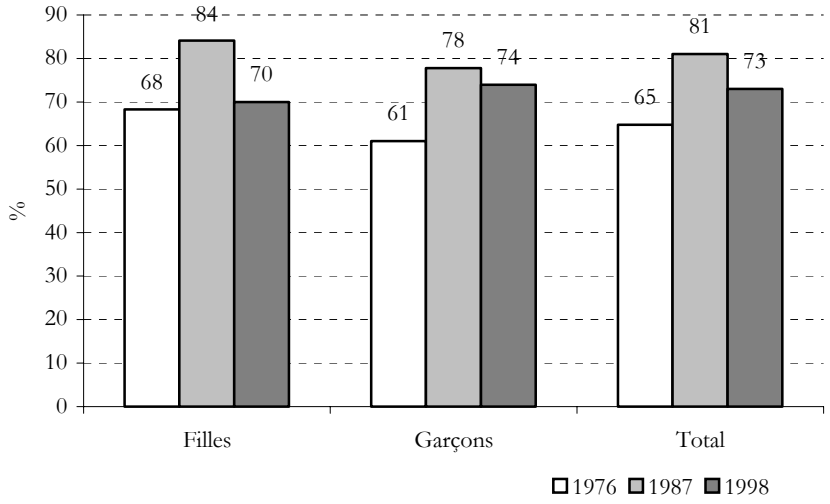

L'augmentation de l'importance relative de la population jeune peut être préjudiciable pour le développement économique et social (Nizamuddin 1994). En effet, la proportion relativement élevée des jeunes (de moins de 15 ans) n'ayant pas encore l'âge de travailler tend à diminuer l'apport de travail par habitant et, partant, toutes choses égales par ailleurs, le revenu par habitant. En outre, elle exige qu'une part plus importante des ressources limitées disponibles soit affectée aux investissements sociaux au détriment des investissements économiques créateurs de richesses. Ces investissements sociaux concernent surtout l'éducation et la santé.

Dans le domaine de l'éducation, la population scolarisable des moins de 15 ans est passé de 3 326 748 personnes en 1976 à 4 870 491 en 1987 et à 6 594 100 en 1998, soit un accroissement moyen de plus de 140 000 jeunes à scolariser théoriquement chaque année dans l'enseignement maternel, primaire et secondaire premier cycle. La population scolarisable de 15-24 ans est passée de 1 331 411 personnes en 1976 à 1 864 283 en 1987, soit un ajout de 48 443 jeunes à scolariser

théoriquement chaque année dans l'enseignement secondaire deuxième cycle et le supérieur. En 1998, cette sous-population se chiffrait à plus de 2,7 millions, ce qui représente une augmentation annuelle de près de 72 000 personnes sur la période 1987-1998.

Dans quelle mesure le gouvernement camerounais a-t-il été à la hauteur de ces besoins de scolarisation ? Le taux de scolarisation des enfants de 6-14 ans est passé de 65 % en 1976 à 81 % en 1987 (figure 2), ce qui témoigne des efforts déployés en matière d'accès à l'éducation, abstraction faite de la qualité de l'enseignement. Mais cette tendance s'est inversée entre 1987 et 1998 puisqu'on observe une baisse du taux de scolarisation de 81 % à 73 %. Cette baisse est attribuable à la conjoncture économique particulièrement défavorable des années 1990 qui, à travers les programmes d'austérité (ajustement structurel, baisse des salaires, dévaluation monétaire), a érodé significativement le pouvoir d'achat des ménages et leur capacité financière à scolariser leurs enfants. Si l'on suppose que l'accès à l'éducation est un besoin fondamental pour les enfants, il ressort que l'ampleur des besoins non-satisfaits en matière de scolarisation, dans la sous-population de 6-14 ans, est de 35 % en 1976, 19 % en 1987 et 27 % en 1998.

Figure 2
Taux de scolarisation des enfants de 6-14 ans au Cameroun
en 1976, 1987 et 1998



Dans le domaine de la santé, la sous-population des moins de cinq ans permet d'évaluer les besoins en services et soins de protection infantile. Si l'on s'en tient à la couverture vaccinale des enfants, des besoins immenses ne sont pas satisfaits. Le pourcentage des enfants de 12-23 mois ayant reçu tous les vaccins du programme élargi de vaccination (PEV) est passé de 41 % en 1991 à 36 % en 1998 (Fotso *et al.* 1999), soit une baisse de 12 % attribuable également à la conjoncture économique des années 1990.

### *2.2. Implications pour les personnes âgées*

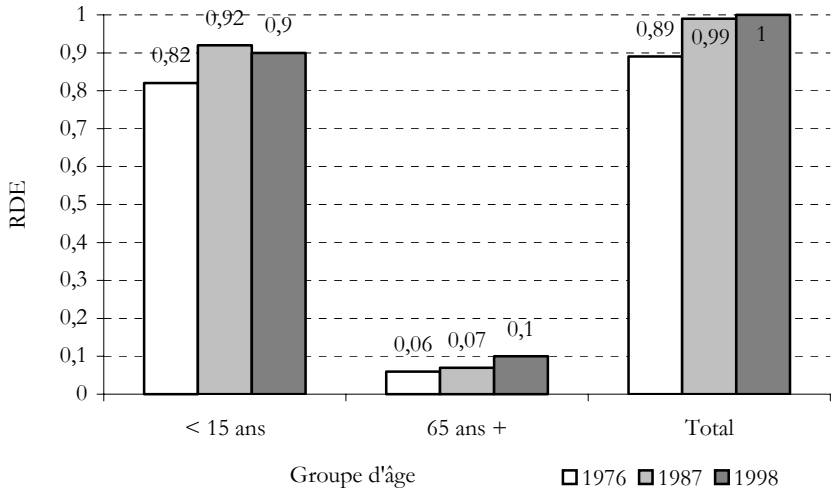
La population âgée de 65 ans et plus, beaucoup plus restreinte, a peu varié dans le temps. Elle est passée de 4 % en 1976 à 3 % en 1987 et à 5 % en 1998 (figure 1). Le processus de vieillissement de la population ne s'est pas enclenché au cours de cette période, probablement à cause des niveaux encore élevés de fécondité et de mortalité adulte. Le vieillissement démographique est donc encore attendu, mais sans doute avec un long décalage dans le temps, le Cameroun n'étant qu'à l'amorce de sa transition démographique. Il n'est donc pas étonnant que le vieillissement démographique et ses implications en termes de prise en charge des personnes âgées ne soient pas une préoccupation politique au Cameroun. En effet, la protection et la prise en charge des personnes âgées n'y bénéficient pas encore d'un cadre juridico-législatif spécifique.

### *2.3. Implications pour la population d'âge actif*

L'augmentation de la population jeune de moins de 15 ans a eu pour corollaire la diminution du poids de la population active. La proportion des personnes de 15-64 ans est passée de 53 % en 1976 à 50 % en 1987 (figure 1), soit une diminution de 3 points. L'une des conséquences de la diminution de la proportion de la population active est l'augmentation de la dépendance économique des personnes inactives vis-à-vis des personnes actives. Cette situation s'illustre par le rapport de dépendance économique, qui est la somme des moins de 15 ans et des plus de 65 ans, rapportée à la population d'âge actif (15-64 ans). Le rapport de dépendance économique est passé de 0,89 en 1976 à 0,99 en 1987. Autrement dit, en 1976, un actif avait à sa charge en moyenne moins d'une personne inactive, alors qu'en 1987, cette charge atteint

une personne. Entre 1991 et 1998, le poids de la population active et le rapport de dépendance économique se sont stabilisés. La charge économique potentielle sur les actifs est essentiellement due aux moins de 15 ans. En effet, le rapport de dépendance des moins de 15 ans et celui des 65 ans et plus sont respectivement de 0,82 et 0,06 en 1976, 0,92 et 0,07 en 1987 et 0,9 et 0,1 en 1998 (figure 3). Seul le rapport de dépendance économique des moins de 15 ans est en augmentation entre 1976 et 1987, mais stable entre 1987 et 1998.

Figure 3
Rapport de dépendance économique (RDE) de la population du Cameroun en 1976, 1987 et 1998




Les figures 4a et 4b illustrent le degré de satisfaction des besoins économiques liés à l'emploi, autrement dit, la capacité d'absorption de la main-d'œuvre par le marché du travail. Il en ressort que le taux d'activité économique a peu varié entre 1976 et 1998, se situant autour de 65 % (figure 4a). Il se dégage également que 35 % de la population active est inoccupée. Mais le taux de chômage est en augmentation durant cette période, passant de 6 % en 1976 à 9 % en 1987 et à 30 % en 1998. L'augmentation significative du chômage entre 1987 et 1998 illustre bien les difficultés économiques des années 1990.

Figure 4a
Taux d'activité par sexe au Cameroun en 1976, 1987 et 1998

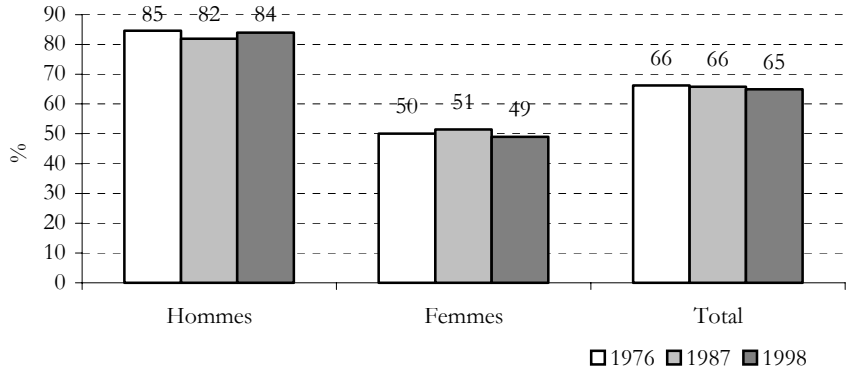
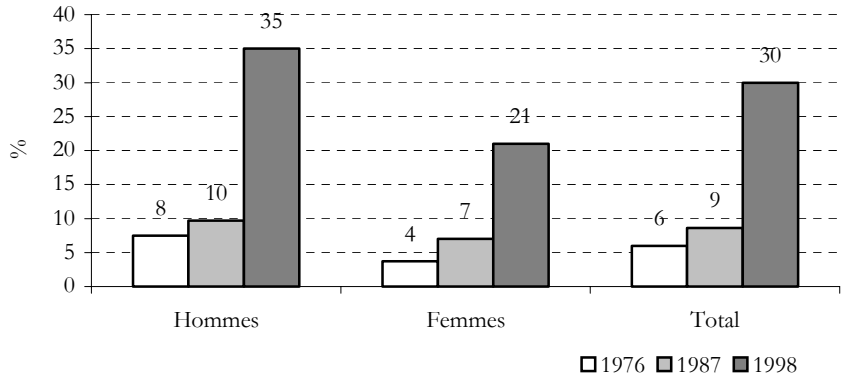



Figure 4b
Taux de chômage par sexe au Cameroun en 1976, 1987 et 1998




### *2.4. Bilan de l'évolution passée : un malus démographique associé à une réponse économique et sociale insuffisante*

En définitive, l'évolution passée de la structure par âge de la population du Cameroun, sur la période 1976-1998, est caractérisée essentiellement par une augmentation de la proportion des jeunes de moins de 15 ans, alimentée par une fécondité encore élevée et une mortalité en forte baisse, surtout dans la sous-population des enfants de moins

de cinq ans. Cette augmentation a entraîné une diminution de la proportion de la population active et un renforcement de la dépendance économique des jeunes vis-à-vis des actifs. Loin d'un bonus démographique, le Cameroun a plutôt vécu un malus démographique caractérisé par un renforcement de la dépendance économique des inactifs sur les actifs, avec comme corollaire l'accroissement des besoins d'investissements sociaux au détriment des investissements économiques créateurs de richesse. Mais la réponse économique et sociale n'a pas été suffisante puisqu'en dépit des efforts consentis, l'État camerounais n'a pu couvrir tous les besoins sociaux et économiques inhérents à la modification de la structure par âge de la population. En 1998, près d'un enfant sur trois n'était pas scolarisé, 35 % de la population active était inoccupée, près d'une personne sur trois était au chômage et 64 % des enfants de 12-23 mois n'avaient pas reçu tous les vaccins prévus par le PEV. Le processus de vieillissement de la population n'est pas véritablement enclenché, la baisse de la fécondité étant encore insuffisante pour diminuer sensiblement la base de la pyramide. Partant de ces changements, comment prévoir l'évolution future de la pyramide des âges du Cameroun et ses implications pour le développement social et économique futur ? Les lignes qui suivent apportent quelques éléments de réponse.

## 3. Évolution prévisionnelle de la structure par âge de la population et ses implications pour le développement économique et social

### *3.1. Méthodologie*

À partir de la structure de la population et des indicateurs démographiques issus de l'Enquête Démographique et de Santé de 1998, nous avons simulé l'évolution future de la pyramide des âges jusqu'en 2033, soit un horizon temporel de 35 ans. Les prévisions sont faites suivant deux scénarios : en l'absence et en tenant compte de la pandémie du VIH/SIDA. Ce second scénario prend donc en considération l'impact du VIH/SIDA, dont la vitesse de propagation est sans précédent. En effet, de moins de 1 % en 1989, la séroprévalence du VIH/SIDA atteint 5 % en 1997, 7 % en 1999 et près de 12 % en 2001 (UNAIDS/WHO/UNICEF 2002). Les prévisions sont faites au

moyen du logiciel SPECTRUM de « Policy Project », un outil de projection des données nécessaires à la mise en œuvre des politiques et programmes de population et de santé reproductive. Les prévisions reposent sur des paramètres démographiques et sur des données épidémiologiques concernant le VIH/SIDA.

### 3.1.1. Les paramètres démographiques

Ils portent sur les hypothèses d'évolution de l'espérance de vie à la naissance, de l'indice synthétique de fécondité et de la migration internationale.

- *Évolution de l'espérance de vie à la naissance.* Comme les Nations Unies (United Nations, 2002) l'ont postulé pour le cas du Cameroun, l'espérance de vie à la naissance pourrait se situer autour de 59 ans pour la période 2000-2005, en l'absence de VIH/SIDA. Dans cette hypothèse, l'espérance de vie augmenterait de 2,5 ans par période quinquennale sur la période de projection. Mais en présence de cette pandémie, l'espérance de vie s'en trouverait sensiblement diminuée, compte tenu de l'impact direct du VIH/SIDA sur la structure de la mortalité, généré par les paramètres épidémiologiques que nous décrivons brièvement plus loin.
- *Évolution de l'indice synthétique de fécondité (ISF).* L'ISF est supposé décroître régulièrement entre 1998 et 2033, passant de 5,2 enfants par femme à 3 enfants par femme.
- *Évolution de la migration internationale.* Nous avons émis l'hypothèse d'un solde migratoire nul et de l'indépendance de la migration internationale vis-à-vis de la structure par âge de la population.
- *Les schémas de mortalité de fécondité.* Le schéma de fécondité choisi est le modèle de l'Afrique subsaharienne des Nations unies. Le schéma de mortalité est le modèle général des tables-types des Nations unies.

### 3.1.2. Les paramètres épidémiologiques du VIH/SIDA

Les paramètres épidémiologiques portent principalement sur les hypothèses d'évolution de la prévalence du VIH/SIDA, le schéma de propagation de l'infection, les paramètres structurels, l'impact supposé du VIH/SIDA sur la fécondité, les paramètres de prise en charge.

- *Évolution de la prévalence du VIH/SIDA.* Nous prenons en considération l'estimation des Nations unies (United Nations 2002) selon laquelle il sera difficile pour les pays fortement affectés de contrôler l'épidémie du VIH/SIDA avant 2050. Par conséquent, nous simulons, sur la période de projection (1998-2033), une évolution continue de la prévalence du VIH/SIDA à partir de son schéma actuel.
- *Schéma de propagation de l'infection.* La transmission du VIH étant en grande partie d'origine hétérosexuelle, nous avons choisi le modèle hétérosexuel associé au progiciel.
- *Les paramètres structurels.* Ils concernent l'année de début de l'épidémie, estimée à 1980, l'espérance de vie après l'apparition du SIDA, estimée à 1 an, et le taux de transmission mère-enfant, estimé à 35 %
- *L'impact supposé du VIH/SIDA sur la fécondité.* L'impact du VIH/SIDA sur la fécondité est mal connu. Nous avons accepté l'option par défaut du progiciel qui considère, sur la base de quelques études empiriques en Afrique, que la fécondité des jeunes femmes de 15 à 19 ans serait de 50 % plus élevée parmi les femmes séropositives que parmi les femmes séronégatives. Chez les femmes de 20 à 49 ans, la fécondité des séropositives serait de 20 % plus faible que celle de leurs congénères séronégatives.
- *Les paramètres de prise en charge.* Il s'agit ici de l'accès au traitement anti-rétroviral. Nous ne disposons d'aucune estimation empirique de la proportion des personnes infectées qui reçoivent le traitement anti-rétroviral. Par conséquent, nos projections ne prennent pas en compte cette variable.

### *3.2. Évolution des indicateurs démographiques de base*

#### 3.2.1. Évolution prévisionnelle de la fécondité

La fécondité, par le biais des naissances, est le principal déterminant de la base de la pyramide des âges. L'évolution prévisionnelle de la fécondité est une baisse modérée. En présence ou en l'absence du VIH/SIDA, l'indice synthétique de fécondité (ISF) passerait de 5,2 enfants par femme en 1998 à 3 enfants en 2033 (annexe 1). En présence comme en l'absence du VIH/SIDA, le capital reproducteur serait sensiblement le même, puisque le taux net de reproduction resterait

largement au-dessus de l'unité. L'effet du VIH/SIDA sur la fécondité n'est pas apparent. En conséquence, la fécondité continuerait d'alimenter la base de la pyramide des âges (voir annexe 2).

3.2.2. Évolution prévisionnelle de la mortalité

L'impact du VIH/SIDA sur la mortalité est catastrophique. En l'absence de cette pathologie, la mortalité des enfants baisserait de façon continue et sensible, passant de 122 ‰ en 1998 à 31 ‰ en 2033 (annexe 1). En présence du VIH/SIDA, les niveaux seraient sensiblement plus élevés de 4 % en 1998 et de 200 % en 2033, avec un rythme de baisse nettement plus faible. Sans la pandémie du VIH/SIDA, l'espérance de vie à la naissance augmenterait régulièrement, passant de 57 ans en 1998 à 75 ans en 2033. Mais le VIH/SIDA diminuerait l'espérance de vie de 2 ans en 1998 et de 37ans en 2033.

3.2.3. Croissance naturelle prévisionnelle

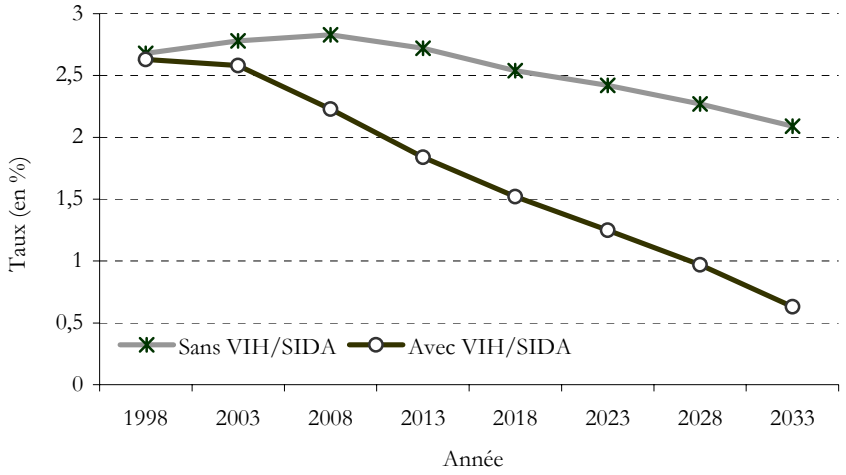
La pyramide des âges se modifie par un effet de structure associé à la transition démographique, dont l'accroissement naturel est le principal dérivé. En conséquence des évolutions de la natalité et de la mortalité, la croissance naturelle (différence entre le taux brut de natalité et le taux brut de mortalité) baisserait plus rapidement en présence du VIH/SIDA, avec des niveaux en deçà de 1 % à partir de 2028 (figure 5). Cette baisse de la croissance naturelle alimenterait plus la base de la pyramide que le sommet (annexe 2), ce qui pourrait ralentir le processus de vieillissement, notamment à cause de la forte mortalité générée par le VIH/SIDA.

### *3.3. Évolution de la structure par âge de la population*

3.3.1. Évolution prévisionnelle de la population jeune

Avec le ralentissement de la croissance naturelle de la population, la proportion des jeunes de moins de 15 ans amorcerait une baisse régulière dès 2003, mais avec un rythme moins rapide en présence du VIH/SIDA et très souvent avec des niveaux plus élevés (figures 6a et 6b). En effet, de 46 % en 1998, cette proportion atteindrait 35 % en 2033 en l'absence du VIH/SIDA et 37 % en présence de la pandémie.

Figure 5
Évolution prévisionnelle du taux de croissance naturelle de la population du Cameroun, 1998-2033




L'évolution prévisionnelle à la baisse de la population jeune laisse donc présager dans l'avenir un relâchement de la pression sociale exercée par les jeunes à travers les investissements sociaux. Mais la pandémie du VIH/SIDA freinerait ce relâchement.

### 3.3.2. Évolution prévisionnelle des personnes âgées

La baisse de la proportion de la population jeune ne semble pas pouvoir enclencher un processus soutenu et continu de vieillissement, tout au moins d'ici 2033. Les prévisions ne révèlent pas d'augmentation de la proportion des personnes de 65 ans et plus. En présence comme en l'absence du VIH/SIDA, cette proportion fluctuerait entre 3 % et 4 % (figures 6a et 6b). Il y a lieu de penser qu'aussi longtemps que la fécondité restera au-dessus du seuil de remplacement des générations et en présence d'une pandémie de VIH/SIDA non maîtrisée tant par la prévention que par l'accès au traitement, un processus soutenu et continu de vieillissement de la population se mettra difficilement en place au Cameroun. Et quand bien même une baisse significative de la fécondité serait amorcée (en deçà du seuil de remplacement des générations) et une réponse sanitaire adéquate au VIH/SIDA mise en place, il

Figure 6a
Évolution des proportions des grands groupes d'âge entre 1998 et 2033
en présence du VIH/SIDA

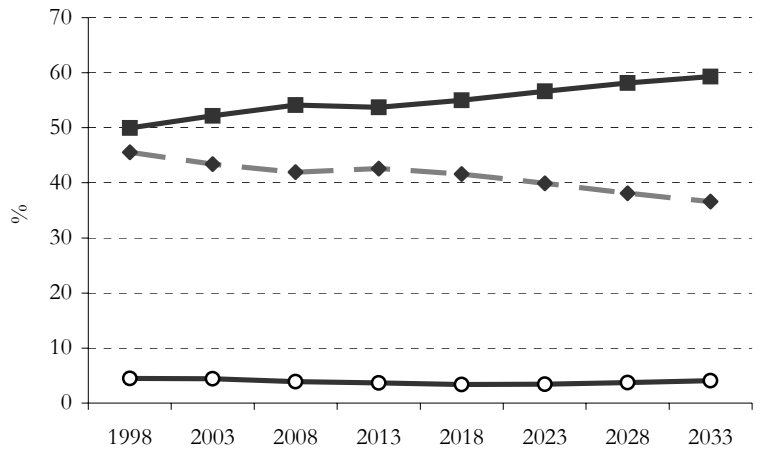
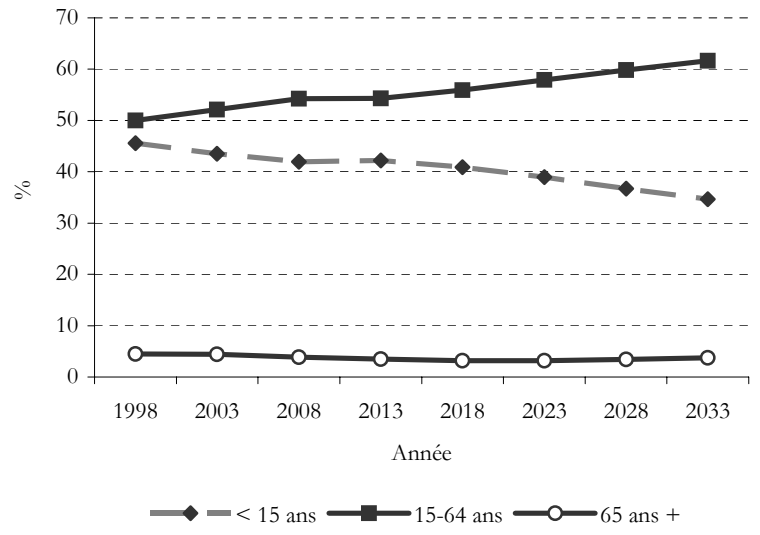



Figure 6b
Évolution des proportions des grands groupes d'âge entre 1998 et 2033
en l'absence du VIH/SIDA



faudra probablement un certain décalage temporel pour voir émerger le vieillissement démographique, compte tenu de l'effet d'inertie structurelle[3].

### 3.3.3. Évolution prévisionnelle de la population active

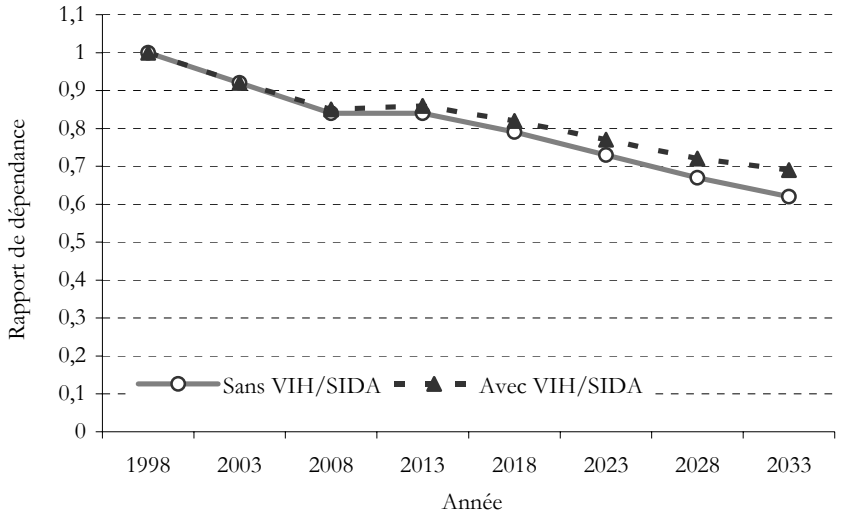
La baisse continue de la proportion des jeunes de moins de 15 ans et la stagnation de la proportion des personnes âgées se feraient au profit de la population active. La proportion des 15-64 ans augmenterait régulièrement dès 2003, mais à un rythme plus lent en présence du VIH/SIDA et très souvent avec des niveaux plus faibles (figures 6a et 6b). Cette augmentation de la proportion de la population active, favorable au système productif et à la création de richesses, se traduit, dès 2003, par une diminution continuelle du rapport de dépendance économique. Mais en présence du VIH/SIDA, les rapports de dépendance seraient, dès 2013, au-dessus des niveaux envisageables en l'absence de la pandémie. En effet, de sa valeur unitaire en 1998, le rapport de dépendance économique tombe à 0,6 et 0,7 en 2033 respectivement en l'absence et en présence du VIH/SIDA (figure 7). La pandémie du VIH/SIDA aurait un effet inhibiteur sur le processus d'émergence du bonus démographique.

### 3.3.4. Bilan de l'évolution future de la structure par âge : l'émergence d'un bonus démographique, mais avec un effet inhibiteur et précarisant du VIH/SIDA

Que retenir de l'évolution prévisionnelle de la structure par âge de la population du Cameroun ? La tendance future, à l'horizon 2033, de la structure par âge de la population est jeune, alimentée par une fécondité, certes en baisse, mais encore largement au-dessus du seuil de remplacement des générations, et par une mortalité dont la baisse régulière est hypothéquée par la pandémie du VIH/SIDA. Cette évolution de la structure par âge se caractériserait néanmoins par une diminution progressive de la proportion des enfants de moins de 15 ans au profit d'une augmentation régulière de celle des 15-64 ans, ce qui laisse entrevoir un relâchement de la pression exercée sur les investissements so-

3. L'effet d'inertie structurelle signifie ici le temps qu'il faudra pour que les conditions nécessaires au vieillissement démographique, une fois réunies, l'enclenchent effectivement.

Figure 7
Évolution des rapports de dépendance entre 1998 et 2033,
avec ou sans VIH/SIDA




ciaux et un renforcement du potentiel productif et de création de richesses. Elle entraînerait également une diminution de la dépendance économique de la population inactive vis-à-vis de la population active. Tout ceci laisserait entrevoir l'émergence d'un modeste bonus démographique, mais sur lequel la pandémie du VIH/SIDA exercerait un effet inhibiteur et précarisant. L'effet serait inhibiteur parce que la prépondérance de la population active et la baisse de la dépendance économique auraient tendance à ralentir en présence de la pandémie. L'effet serait précarisant car l'émergence du bonus démographique se ferait avec une perte de productivité du travail due au VIH/SIDA. En outre, ce modeste bonus démographique pourrait être contrebalancé par un effet du « momentum »[4], notamment par une réponse pronataliste à la pandémie du VIH/SIDA, provoquant une reprise de la fécondité et de la croissance de la population. Le processus de vieillissement, c'est-à-dire l'augmentation progressive de la proportion des 65 ans et plus, est une éventualité peu probable d'ici 2033. Sans être totalement écarté, le vieillissement démographique nécessiterait une baisse

4. Pour une définition de l'effet du « momentum », lire le chapitre 2 du présent ouvrage, par Ian Pool.

significative du potentiel reproducteur, une réponse adéquate à la pandémie du VIH/SIDA et un décalage temporel plus important.

### 3.3.5. Implications pour la réalisation des objectifs du millénaire pour le développement.

Le bonus démographique, défini ici comme un processus continu de prépondérance de la population économiquement active et de baisse de la dépendance économique des personnes inactives vis-à-vis des personnes actives, ne peut être effectif s'il n'est pas soutenu par des politiques adéquates dans les domaines de la santé, du capital humain et de l'économie. Tout ceci concourt à la réalisation des objectifs du millénaire pour le développement (OMD). Quelles sont les implications pour la réalisation des OMD suggérées par l'évolution prévisionnelle de la structure par âge de la population du Cameroun ? Quel chemin sera parcouru à l'horizon temporel 2015, date choisie pour l'évaluation à mi-parcours des OMD ? Les lignes qui suivent apportent quelques éléments de réponse.

*Dans le domaine de la santé.* Le défi majeur sera d'apporter une réponse efficace en matière de santé sexuelle et reproductive. Il sera difficile de stopper la propagation du VIH/SIDA en 2015, puisque la prévalence au sein de la population adulte atteindrait les 20 % (annexe 2). En 2015 et en l'absence d'une prévention et d'une prise en charge efficace, on pourrait s'attendre à une incidence annuelle de 208 000 cas, parmi lesquels 52 000 naissances d'enfants séropositifs. Cette incidence constituerait également une menace importante pour la productivité du travail. En 2015, le SIDA aura tué environ 1,65 million d'individus au Cameroun. À cette même date, le niveau de mortalité des enfants des années 1990 (environ 147 ‰) n'aura pas été réduit de deux tiers conformément aux attentes des OMD, puisqu'il serait autour de 96 ‰ (annexe 2). Une amélioration substantielle de l'accès aux services de santé reproductive (contraception et maternité à moindres risques), en tant que déterminant d'une baisse sensible de la fécondité et de la dépendance économique, constitue également un des défis à relever pour tirer meilleur profit du bonus démographique. Ce défi passe nécessairement par des politiques de promotion du statut de la femme. Le constat actuel en matière d'accès aux services de santé reproductive, faisant état d'une dégradation sensible de la situation au cours des an-

nées 1990 (Beninguissé 2003), ne permet pas d'envisager avec optimisme la réalisation de l'objectif de réduction de trois quarts de la mortalité maternelle d'ici 2015.

*Dans le domaine du capital humain.* Le principal défi sera de doter la population des qualifications nécessaires pour l'accès aux emplois, et l'éducation est la clé pour y parvenir. En 2015, c'est de près de 9 millions d'enfants de moins de 15 ans qu'il faudra assurer la scolarisation primaire. Si le mouvement de baisse du taux de scolarisation primaire enregistré au cours des années 1990 devrait se poursuivre dans l'avenir, il sera difficile d'atteindre en 2015 l'objectif de l'éducation primaire universelle.

*Dans le domaine de l'économie.* La mise en œuvre d'une politique économique favorable à la création d'emplois et une politique de bonne gouvernance constituent des déterminants clés pour tirer effectivement avantage du bonus démographique. Si le contexte actuel de mauvaise gouvernance (montée de la corruption) et de morosité économique (poids important de la dette, faiblesse du pouvoir d'achat, faible capacité de mobilisation de l'épargne, accès limité au crédit, etc.), avec ses corollaires en termes d'accentuation du chômage, devait se poursuivre dans un avenir proche, il sera difficile de réduire sensiblement la pauvreté d'ici 2015.

## 4. Conclusion

Le changement de structure par âge d'une population est un processus inéluctable de la dynamique démographique, en particulier des tendances de la fécondité et de la mortalité et, dans certains cas, des migrations (Sala-Diakanda 1992). Les enjeux sont énormes pour le développement économique et social et, pour les pays en développement (africains en particulier), le faible dynamisme des économies pose le défi crucial de satisfaction des besoins fondamentaux inhérents aux transitions des pyramides des âges. Nous avons tenté, dans ce chapitre, d'en apprécier l'ampleur et les implications pour le développement économique et social au Cameroun. D'une évolution passée, mesurée entre 1976 et 1998, caractérisée par un rajeunissement renforçant la base de la pyramide et l'augmentation de la dépendance économique,

on postule pour l'avenir l'émergence d'un modeste bonus démographique caractérisé par une diminution progressive de la proportion de la population jeune au profit d'une augmentation régulière de la population active et d'une baisse continue de la dépendance économique. Mais la pandémie du VIH/SIDA, dont la maîtrise est difficilement envisageable sur la période de projection 1998-2033, aura un effet inhibiteur et précarisant sur le bonus démographique. En outre, ce bonus démographique pourrait être contrebalancé par une réponse pronataliste à la pandémie du VIH/SIDA. Dans ce contexte épidémiologique, il sera difficile d'atteindre les objectifs du millénaire pour le développement. Des défis majeurs interpellent donc les autorités de l'État pour la mise en place de politiques adéquates dans les domaines de la santé, de l'éducation et de l'économie.

**Références bibliographiques**

BENINGUISSE, G (2003) *Entre tradition et modernité. Fondements sociaux de la prise en charge de la grossesse et de l'accouchement au Cameroun,* Academia-Bruylant/L'Harmattan, Louvain-la-Neuve/Paris.

BLOOM, D E, CANNING, D et SEVILLA, J (2003) *The Demographic Dividend. A New Perspective on the Economic Consequences of Population Change*, RAND, Santa Monica, Calif.

FOTSO, M, NDONOU, R, LIBITÉ, P L, TSAFACK, M, WAKOU, R, GHAPOUTSA, A, KAMGA, S, KEMGO, K, FANKAM, M, KAMDOUM, A et BARRÈRE, B (1999) *Enquête Démographique et de Santé. Cameroun, 1998*, Bureau Central des Recensements et des Études de Population, Demographic and Health Survey.

NIZAMUDDIN, M (1994) « Croissance démographique, évolution de la pyramide des âges et incidences sur le développement », *Le Courrier*, p. 55-61.

SALA-DIAKANDA, M (1992) *Introduction à l'étude des populations*, Les documents pédagogiques de l'IFORD, Yaoundé.

UNAIDS/WHO/UNICEF (2002) *Epidemiological Feats by Country*, http://www.who.int/emc hiv/fact_sheets/All_countries_plain.htm#Africa.

UNITED NATIONS (2002) *World Population Prospects. The 2000 Revision*, Volume III : *Analytical Report*, UN Population Division, New York.

## Annexe 1 — Indicateurs démographiques et épidémiologiques du Cameroun

Indicateurs démographiques, estimations de 1998 à 2033 en l'absence du VIH/SIDA

| | 1998 | 2003 | 2008 | 2013 | **2015** | 2018 | 2023 | 2028 | 2033 |
|---|---|---|---|---|---|---|---|---|---|
| Fécondité | | | | | | | | | |
| Ind. Synth. de Fécondité saisi | 5,2 | 4,89 | 4,57 | 4,26 | **4,13** | 3,94 | 3,63 | 3,31 | 3 |
| Taux Brut de Reproduction | 2,54 | 2,39 | 2,23 | 2,08 | **2,01** | 1,92 | 1,77 | 1,61 | 1,46 |
| Taux Net de Reproduction | 2,09 | 2,02 | 1,94 | 1,85 | **1,81** | 1,75 | 1,64 | 1,52 | 1,4 |
| Âge moyen de procréation | 27,9 | 27,9 | 28,0 | 28,0 | **28,0** | 28,0 | 27,7 | 27,3 | 27,0 |
| Rapport enfants-femmes | 0,69 | 0,70 | 0,66 | 0,64 | **0,62** | 0,59 | 0,54 | 0,50 | 0,46 |
| Table de fécondité : modèle « Afrique sub-sahar. » des NU | | | | | | | | | |
| Mortalité | | | | | | | | | |
| e° hommes | 56,0 | 58,5 | 61,0 | 63,5 | **64,5** | 66,0 | 68,5 | 71,0 | 73,5 |
| e° femmes | 58,0 | 60,5 | 63,0 | 65,5 | **66,5** | 68,0 | 70,5 | 73,0 | 75,5 |
| e° totale | 57,0 | 59,5 | 62,0 | 64,5 | **65,5** | 67,0 | 69,5 | 72,0 | 74,5 |
| Taux de Mortalité Infantile | 84,6 | 75,0 | 65,7 | 56,7 | **53,1** | 48,1 | 39,9 | 32,3 | 25,2 |
| Taux de Mortalité 0-4 ans | 122,4 | 106,2 | 91,0 | 76,6 | **71,2** | 63,5 | 51,3 | 40,5 | 30,9 |
| Table de mortalité : modèle général des NU | | | | | | | | | |
| Taux bruts | | | | | | | | | |
| Taux Brut de Natalité (‰) | 39,3 | 38,7 | 37,7 | 35,1 | **33,9** | 32,1 | 29,8 | 27,5 | 25,2 |
| Taux Brut de Mortalité (‰) | 12,5 | 10,9 | 9,4 | 7,9 | **7,4** | 6,7 | 5,6 | 4,8 | 4,3 |
| Tx d'Accroiss. Naturel (%) | 2,68 | 2,78 | 2,83 | 2,72 | **2,66** | 2,54 | 2,41 | 2,26 | 2,09 |
| Temps de doublement | 26,2 | 25,3 | 24,8 | 25,9 | **26,4** | 27,6 | 29,1 | 30,9 | 33,5 |
| Naissances et décès annuels (milliers) | | | | | | | | | |
| Naissances | 562,7 | 637 | 716,4 | 767,8 | **783,8** | 800,5 | 841,6 | 874,9 | 893,7 |
| Décès | 179,0 | 179,7 | 178,9 | 173,5 | **170,6** | 166,1 | 159,1 | 154,2 | 150,9 |
| Population (millions) | | | | | | | | | |
| Population totale | 14,34 | 16,47 | 18,99 | 21,87 | **23,09** | 24,97 | 28,29 | 31,82 | 35,5 |
| Population masculine | 6,88 | 7,98 | 9,29 | 10,78 | **11,41** | 12,39 | 14,11 | 15,94 | 17,83 |
| Population féminine | 7,45 | 8,48 | 9,7 | 11,09 | **11,67** | 12,58 | 14,18 | 15,88 | 17,67 |
| Pourcentage 0-4 ans | 15,5 | 16,59 | 16,49 | 15,93 | **15,5** | 14,84 | 13,84 | 13,00 | 12,11 |
| Pourcentage 5-14 | 30,04 | 26,91 | 25,43 | 26,26 | **26,26** | 26,06 | 25,1 | 23,73 | 22,53 |
| Pourcentage 15-49 | 42,38 | 45,8 | 48,15 | 48,11 | **48,58** | 49,39 | 50,72 | 51,94 | 52,87 |
| Pourcentage 15-64 | 49,96 | 52,1 | 54,25 | 54,32 | **54,89** | 55,94 | 57,91 | 59,86 | 61,63 |
| Pourcentage 65 ans et plus | 4,50 | 4,40 | 3,84 | 3,50 | **3,34** | 3,16 | 3,15 | 3,41 | 3,74 |
| Pourcentage femmes 15-49 | 43,00 | 46,23 | 48,63 | 48,76 | **49,08** | 49,7 | 50,75 | 51,66 | 52,41 |
| Rapport de masculinité | 92,31 | 94,14 | 95,8 | 97,25 | **97,77** | 98,49 | 99,5 | 100,32 | 100,95 |
| Rapport de dépendance | 1,00 | 0,92 | 0,84 | 0,84 | **0,82** | 0,79 | 0,73 | 0,67 | 0,62 |
| Âge moyen | 17 | 18 | 18 | 19 | **19** | 19 | 20 | 21 | 23 |

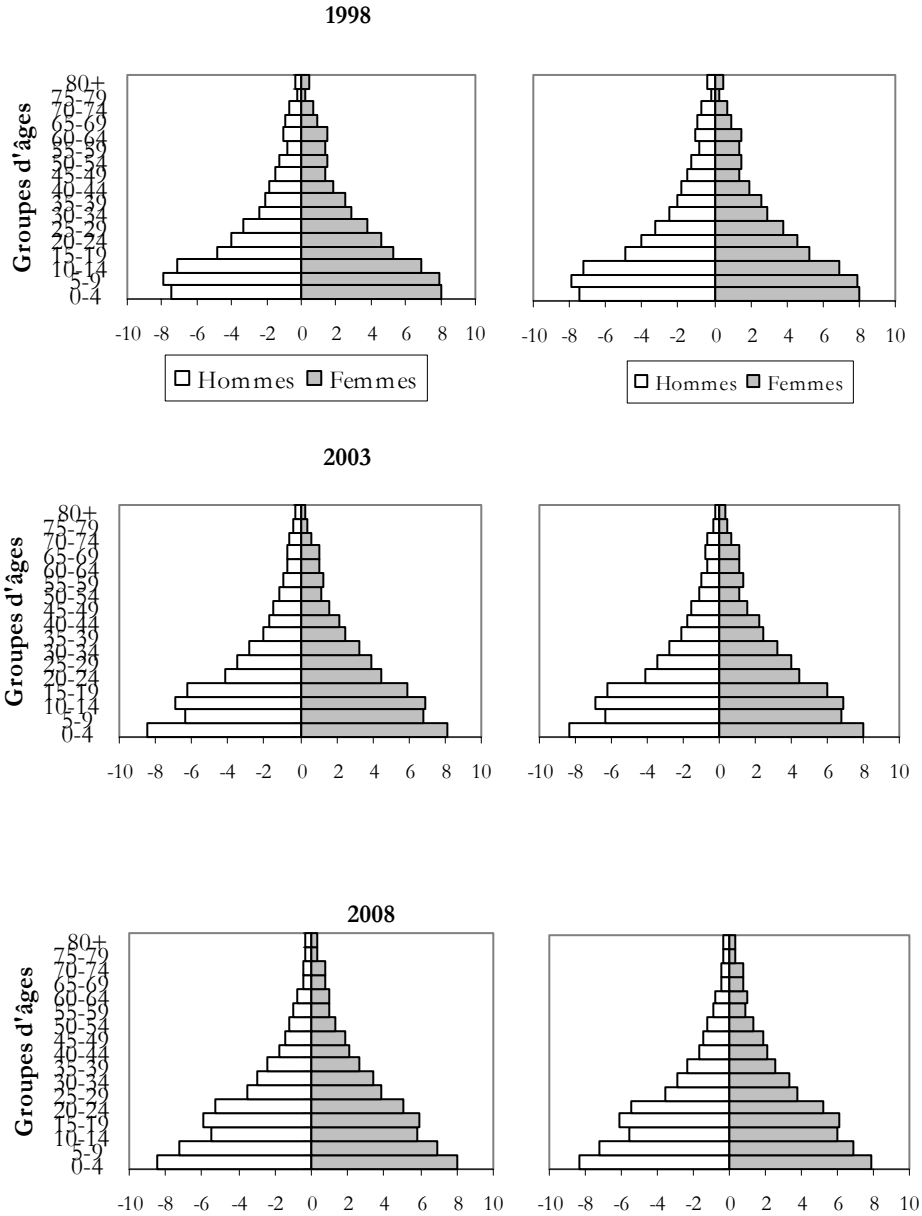
Indicateurs démographiques, estimations de 1998 à 2033 en présence du VIH/SIDA

| | 1998 | 2003 | 2008 | 2013 | **2015** | 2018 | 2023 | 2028 | 2033 |
|---|---|---|---|---|---|---|---|---|---|
| Fécondité | | | | | | | | | |
| Ind. Synth. de Fécondité saisi | 5,2 | 4,89 | 4,57 | 4,26 | **4,13** | 3,94 | 3,63 | 3,31 | 3 |
| ISF calculé | 5,2 | 4,89 | 4,57 | 4,26 | **4,13** | 3,94 | 3,63 | 3,31 | 3 |
| Taux Brut de Reproduction | 2,54 | 2,39 | 2,23 | 2,08 | **2,01** | 1,92 | 1,77 | 1,61 | 1,46 |
| Taux Net de Reproduction | 2,09 | 2,02 | 1,94 | 1,85 | **1,81** | 1,75 | 1,64 | 1,52 | 1,4 |
| Âge moyen de procréation | 27,9 | 27,9 | 28 | 28 | **28,0** | 28,0 | 27,7 | 27,3 | 27 |
| Rapport enfants-femmes | 0,69 | 0,69 | 0,66 | 0,64 | **0,63** | 0,6 | 0,56 | 0,52 | 0,49 |
| Table de fécondité : modèle « Afrique sub-sahar. » des NU | | | | | | | | | |
| Mortalité | | | | | | | | | |
| e° hommes | 54,2 | 50,9 | 44,9 | 42,8 | **43,0** | 42,1 | 40,9 | 39,3 | 38,0 |
| e° femmes | 56,4 | 53,7 | 46,6 | 43,7 | **43,7** | 42,5 | 40,8 | 39 | 37,4 |
| e° totale | 55,4 | 52,3 | 45,8 | 43,3 | **43,3** | 42,3 | 40,8 | 39,2 | 37,7 |
| Taux de Mortalité Infantile | 86,3 | 85,0 | 79,3 | 73,2 | **70,7** | 67,4 | 61,8 | 56,9 | 52,6 |
| Taux de Mortalité 0-4 ans | 127,0 | 119,1 | 109,3 | 99,5 | **95,5** | 90,3 | 81,9 | 75,2 | 69,6 |
| Table de mortalité : modèle général des NU | | | | | | | | | |
| Taux bruts | | | | | | | | | |
| Taux Brut de Natalité (‰) | 39,3 | 38,8 | 37,8 | 35,2 | **34,1** | 32,3 | 30,4 | 28,7 | 26,7 |
| Taux Brut de Mortalité (‰) | 13,0 | 13,0 | 15,5 | 16,8 | **16,9** | 17,1 | 17,9 | 19,0 | 20,4 |
| Tx d'Accroiss. Naturel (%) | 2,62 | 2,58 | 2,23 | 1,84 | **1,72** | 1,51 | 1,26 | 0,97 | 0,63 |
| Temps de doublement | 26,8 | 27,2 | 31,4 | 38,1 | **40,7** | 46,1 | 55,5 | 72,1 | 110,2 |
| Naissances et décès annuels (milliers) | | | | | | | | | |
| Naissances | 562,73 | 634,59 | 697 | 717,95 | **720,3** | 716,05 | 722,63 | 719,47 | 697 |
| Décès | 186,62 | 212,8 | 285,4 | 342,89 | **356,78** | 380,29 | 424,12 | 477,27 | 532,45 |
| Population (millions) | | | | | | | | | |
| Population totale | 14,34 | 16,36 | 18,46 | 20,41 | **21,15** | 22,18 | 23,75 | 25,08 | 26,07 |
| Population masculine | 6,88 | 7,93 | 9,02 | 10,06 | **10,46** | 11,02 | 11,88 | 12,62 | 13,18 |
| Population féminine | 7,45 | 8,43 | 9,44 | 10,35 | **10,69** | 11,16 | 11,87 | 12,46 | 12,89 |
| Pourcentage 0-4 ans | 15,50 | 16,38 | 16,25 | 15,68 | **15,26** | 14,61 | 13,74 | 13,10 | 12,40 |
| Pourcentage 5-14 | 30,04 | 27,01 | 25,69 | 26,9 | **27,04** | 27,00 | 26,18 | 25,01 | 24,19 |
| Pourcentage 15-49 | 42,38 | 45,89 | 48,08 | 47,71 | **48,07** | 48,80 | 50,18 | 51,53 | 52,58 |
| Pourcentage 15-64 | 49,96 | 52,18 | 54,14 | 53,75 | **54,16** | 55,00 | 56,65 | 58,15 | 59,34 |
| Pourcentage 65 ans et plus | 4,50 | 4,42 | 3,92 | 3,66 | **3,53** | 3,38 | 3,44 | 3,74 | 4,06 |
| Pourcentage femmes 15-49 | 43,00 | 46,3 | 48,48 | 48,13 | **48,25** | 48,66 | 49,51 | 50,36 | 51,04 |
| Rapport de masculinité | 92,31 | 94,02 | 95,57 | 97,18 | **97,82** | 98,74 | 100,12 | 101,32 | 102,29 |
| Rapport de dépendance | 1,00 | 0,92 | 0,85 | 0,86 | **0,85** | 0,82 | 0,77 | 0,72 | 0,69 |
| Âge moyen | 17 | 18 | 18 | 19 | **19** | 19 | 19 | 20 | 21 |

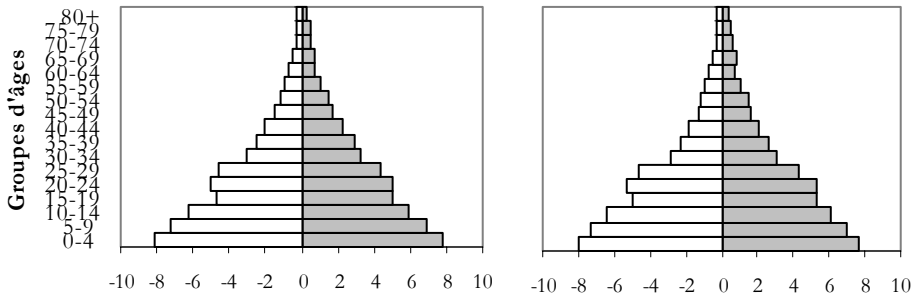
Indicateurs épidémiologiques relatifs au VIH/SIDA

| | 1998 | 2003 | 2008 | 2013 | **2015** | 2018 | 2023 | 2028 | 2033 |
|---|---|---|---|---|---|---|---|---|---|
| Population VIH (millions) | | | | | | | | | |
| Total | 0,41 | 1,10 | 1,60 | 2,08 | **2,29** | 2,64 | 3,28 | 3,96 | 4,61 |
| Hommes | 0,34 | 0,58 | 0,77 | 0,95 | **1,06** | 1,23 | 1,55 | 1,90 | 2,24 |
| Femmes | 0,06 | 0,51 | 0,83 | 1,12 | **1,23** | 1,41 | 1,73 | 2,06 | 2,37 |
| Prévalence adultes | 6,00 | 13,11 | 15,91 | 18,72 | **19,84** | 21,52 | 24,34 | 27,15 | 29,95 |
| Nouveaux cas de SIDA (milliers) | | | | | | | | | |
| Total | 7,91 | 43,9 | 124,05 | 188,39 | **208,00** | 239,76 | 298,81 | 364,69 | 430,74 |
| Hommes | 4,31 | 22,93 | 60,70 | 90,62 | **100,57** | 116,19 | 146,31 | 180,86 | 215,59 |
| Femmes | 3,60 | 20,96 | 63,34 | 97,76 | **107,43** | 123,57 | 152,5 | 183,83 | 215,15 |
| Naissances séropositives annuelles (milliers) | | | | | | | | | |
| Total | 3,85 | 26,29 | 39,19 | 49,24 | **52,4** | 57,24 | 65,68 | 73,66 | 79,02 |
| Pourcentage | 0,68 | 4,14 | 5,62 | 6,86 | **7,28** | 7,99 | 9,09 | 10,24 | 11,34 |
| Décès annuels dus au SIDA (milliers) | | | | | | | | | |
| Total | 7,48 | 33,86 | 110,34 | 178,8 | **198,18** | 230,01 | 287,30 | 352,41 | 418,67 |
| Hommes | 4,07 | 18,14 | 54,69 | 86,88 | **95,61** | 111,17 | 140,34 | 174,38 | 209,23 |
| Femmes | 3,41 | 15,73 | 55,65 | 91,92 | **102,57** | 118,84 | 146,96 | 178,04 | 209,44 |
| Par millier | 0,52 | 2,07 | 5,98 | 8,76 | **9,37** | 10,37 | 12,10 | 14,05 | 16,06 |
| Décès cumulatifs dus au SIDA (millions) | | | | | | | | | |
| Total | 0,01 | 0,11 | 0,49 | 1,26 | **1,65** | 2,31 | 3,62 | 5,25 | 7,22 |
| Hommes | 0,00 | 0,06 | 0,25 | 0,62 | **0,81** | 1,13 | 1,77 | 2,57 | 3,55 |
| Femmes | 0,00 | 0,05 | 0,24 | 0,64 | **0,84** | 1,18 | 1,85 | 2,68 | 3,67 |

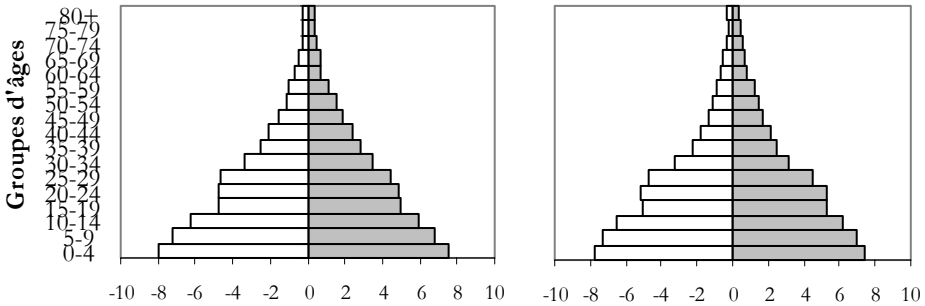
Annexe 2
Pyramides des âges du Cameroun, 1988-2033,
sans VIH/SIDA (à gauche) et avec VIH/SIDA (à droite)



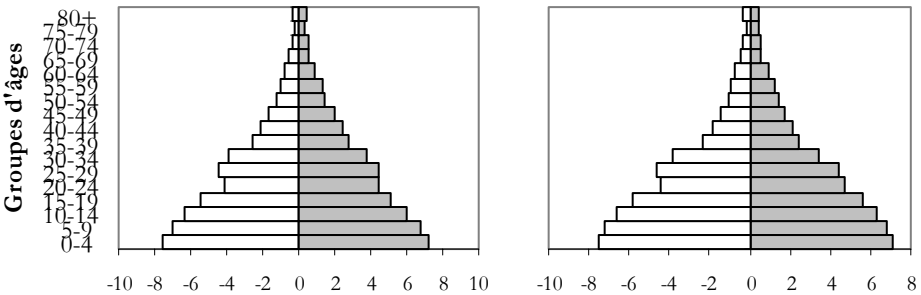
**2013**



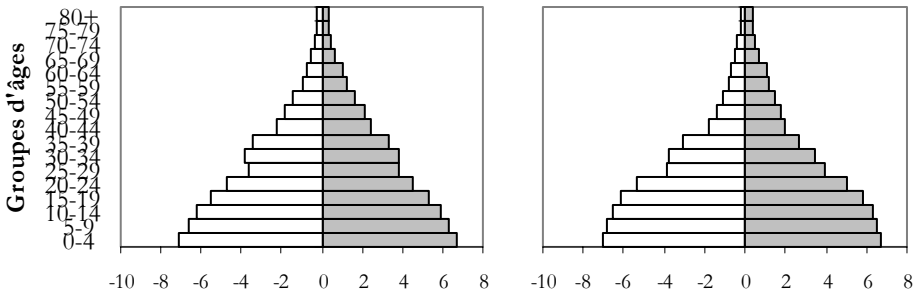

**2015**



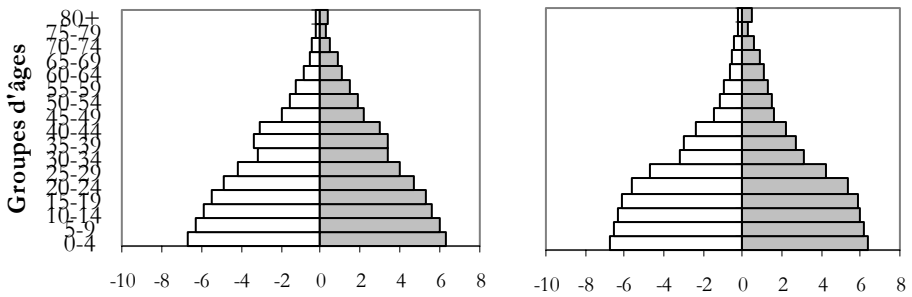

**2018**



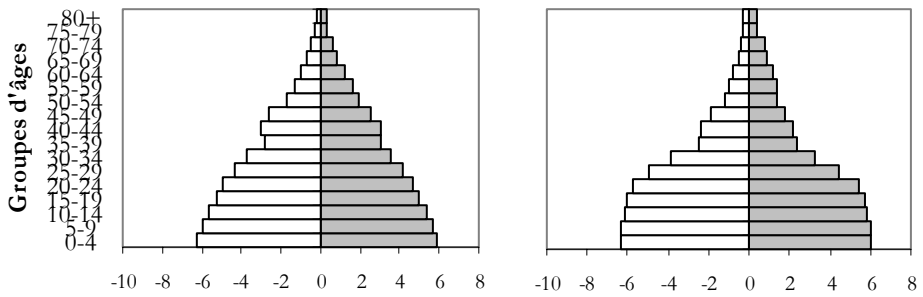
**2023**




**2028**




**2033**



# 6

# AGE-STRUCTURAL TRANSITIONS AND THEIR IMPLICATIONS: THE CASE OF INDONESIA OVER A CENTURY, 1950-2050

**Sri Moertiningsih ADIOETOMO**[1]

***Abstract***

This paper analyses the causes and impacts of Age-Structural Transitions over a century using empirical data from 1950 to 2000 and population projections from 2000 to 2050 (UN World Population Prospects, medium projection). Three phases of population momentum are observed: The first, one of "waves", occurred because of disorders in the patterns of birth and death. The second was due to the success of family planning program. The third phase is one of waves that is occurring today and will unfold in future carrying with it incipient indications of long-term aging.

A "window of opportunity" has been identified here to occur between 2020-2030, but only for a decade. At that stage the dependency ratio will fall below 45 per 100 at working ages. If the government were able to create enough employment opportunities carrying with them decent income, Indonesia could exploit a demographic bonus, because a large number at working ages with adequate incomes and high levels of saving (because the dependency burden is low) would induce increased investment in quality human resources.

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## 1. Introduction

Indonesia is the country with the fourth largest population after China, India, and USA, 206 million people in 2000. Its age-structural transitions are important, therefore, not only for its own development, but are of global significance.

The aim of the study is to present a result of analysis on age-structural transitions in Indonesia – their determinants, their trajectories and their social and economic implications – over a century (1950-2050) using empirical data from 1950-2000 and simulations based on the UN medium population projection from 2005 to 2050 (United Nations Population Division, 2003). It presents evidence of demographic changes leading to shifts in the age structure, which will reshape the future of the Indonesian population.

Indonesia has gone through, or will go through, three phases of an age-structural transition in producing different patterns of momentum and population waves.[2] The past trends of declining birth and death rates have produced waves that will continue to affect the society well into the future, at least as far as 2050.

## 2. The Data

This analysis covers the period 1950 to 2050. The first half of the period (1950 to 2000) was observed from empirical data, mainly from the population censuses, plus using some estimates based on indirect methods as well as from national surveys collected by the Central Bureau of Statistics. Observations about population dynamics and changes in age structure for the period 2005-2050 were based on the UN Population Projection (the revised format of the 2002 UN Projection).

Single-age data on Indonesian populations are not very reliable because they usually suffer from digital preferences at ages 0 and 5. Therefore this age-structural analysis is grouped by five years. Even though census taking since 1961 has become better and provided more reliable results, the single-age data still show age misstatements. Further, the fieldwork for the 2000 census has not yet been fully com-

2. Defined in an earlier chapter in this collection by Ian Pool and Laura Rodríguez Wong.

pleted because of ethnic conflicts, and violence in some provinces, leaving three out of 30 provinces not yet enumerated. As a result, the numbers and age structures of the populations in these provinces had to be estimated, and therefore lack consistency with the 1990 data. Nevertheless, in general the analysis of changes in the proportions of population in certain broad age bands, such as the under-five, 5-14 years, prime working ages and the "aged" are still very useful in analyzing the age-structural transition and its social and economic impact.

## 3. Early Phase: Setting in Train Population Waves (Prior to 1980)

### *3.1. Age Distribution of the 1961 Population*

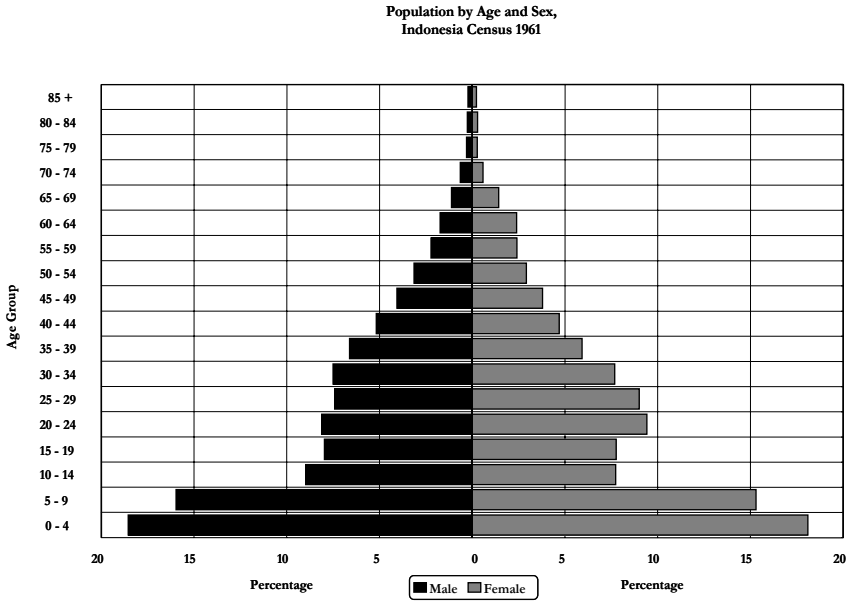
It is necessary to start this analysis at an early post-war census, 1961. The age structure of the 1961 population of Indonesia was very much influenced by the fluctuations in birth and death rates during the World War, the Japanese occupation, and the War of Independence, and the shift back to a normal high birth rate when Indonesia got its Independence in the early 1950s (Widjoyo 1970).

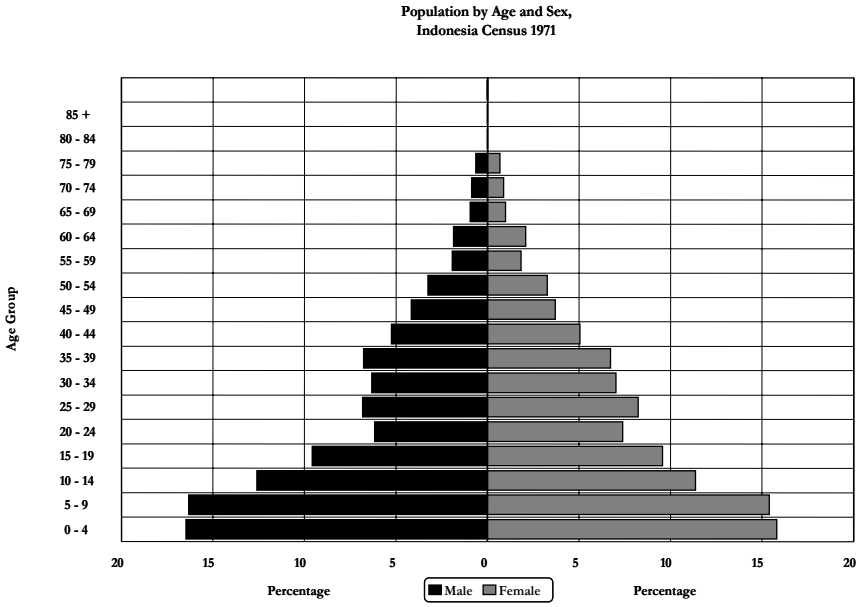
Figure 1 shows that the proportion of the population aged 0-9 years (cohorts born in the 1950s) in 1961 was almost double that for persons aged 10-19 (cohorts born in the 1940s), reflecting the decrease in birth rates during the war and the increase thereafter. This effect still shows up in the age structure of the 1971 population, by which year the hollow in the 1961 population pyramid was shifted to a higher age group, to ages 20-29 years.

Although mortality has shown a tendency to decline, the rate in 1961 was still high, resulting in low proportions at older ages. This also explains the "inverted cone" shape of the population pyramid in 1961 with small proportions reaching older ages, only 3.7 per cent.

The birth of larger cohorts in the 1950s is shown by the increase in the size of the population aged 15-29 years 1966-1980, and aged 30-44 1980-1991. This resulted in a "radical rejuvenation" of the working-age population, ensuring that the working-age population consisted of high proportions at younger ages. Similarly, large numbers of women entered the reproductive period and the working ages at this time, thereby producing large birth cohorts in the 1980s even though fertility had started to decline.

Figure 1
Age structures, Indonesia 1961 and 1971



The high birth rates of the past led to high proportions of children aged less than 15 years in 1961 compared to the working-age population. Taking into account also the number of older persons aged 65 and above, the dependency ratio in 1961 was 82 per 100 working-age population (Table 1).

Table 1
Demographic indicators, Indonesia, 1950-2000

| | 1950 | 1961 | 1971 | 1980 | 1990 | 2000 |
|---|---|---|---|---|---|---|
| Population (thousands) | 79,538 | 97,019 | 118,367 | 146,775 | 179,246 | 205,843 |
| Women 15-49 (thousands) | 19,199 | 23,751 | 28,619 | 35,941 | 46,088 | 57,336 |
| Population 0-14 (thous.) | 31,099 | 41,035 | 52,040 | 60,041 | 65,690 | 63,206 |
| Population 15-64 (thous.) | 45,257 | 53,376 | 63,344 | 81,944 | 106,801 | 133,057 |
| Population 65+ (thous.) | 3,181 | 2,608 | 2,983 | 4,790 | 6,755 | 9,580 |
| Dependency ratio (%) | 75.75 | 81.77 | 86.84 | 79.09 | 67.83 | 54.70 |
| | | 1950-61 | 1961-71 | 1971-80 | 1980-90 | 1990-2000 |
| Annual rate of increase (%) | | 1.8 | 2.1 | 2.32 | 1.98 | 1.39 |
| Births per year (thousands) | | 3,827 | 5,100 | 5,332 | 4,984 | 4,118 |
| Number of deaths (thous.) | | 2,186 | 2,143 | 1,965 | 1,704 | 1,568 |
| Crude Birth Rate (per 1000 population) | | 43.8 | 42.7 | 39.9 | 29.9 | 20.7 |
| Crude Death Rate (per 1000 population) | | 25.2 | 21.5 | 16.7 | 10.1 | 6.9 |
| | | | 1967-70 | 1976-79 | 1986-89 | 1996-99 |
| Total Fertility Rate (children per woman) | | | 5.61 | 4.68 | 3.33 | 2.34 |
| | | | 1967 | 1976 | 1986 | 1996 |
| Infant Mortality Rate (per 1000 births) | | | 145 | 109 | 71 | 47 |
| Life expectancy (years) | | | 45.7 | 52.2 | 59.8 | 65.4 |

### *3.2. The Age Structure of the 1971 Population*

The estimated Crude Birth Rate at the 1971 census was 42.7 per 1000 population, while the Crude Death Rate was 21.5 per 1000 popu-

lation, resulting in an increase in population growth from 1.8% per annum during the period 1950 to 1961 to 2.1% in 1961-1971. The Republic of Indonesia under Sukarno (1945-1965) was able to continue to improve the health status of the population as is indicated by the declining Infant Mortality Rate from 176 deaths per 1000 births in the 1950s to 145 in 1967 (Table 1). This meant that more babies survived to older ages, which is indicated by the fact that proportions in the 1971 population pyramid who were children aged 0-4 and 5-9 years were the same. While the estimation of adult mortality rates then was still a problem due to the unreliability of the baseline information, policymakers were confident that there had been declines in mortality at all ages. This was because of the improvements in medical technology at that time, especially the spread of antibiotics which helped reduce the prevalence of communicable diseases such as plague, smallpox and malaria (Hugo *et al.* 1987).

On the other hand, the fertility level remained high with an average of 5 to 6 children per woman during the period 1967-1971 (CBS 1988), a level equivalent to 5.1 million births per year during 1961-1971. The steady high fertility and the rapid declines in mortality resulted in a higher proportion of children 0-14 years compared to the working-age population and thus an increase in the dependency ratio from 82 in 1961 to 87 in 1971 (Table 1).

The period of the early 1970s was marked by an increasing awareness about an impending population explosion as an impact of the declining mortality and the steady high fertility. The Indonesian government was aware there would be increasing population pressures if birth control was not adopted to halt growth. A national family planning programme was finally launched in 1971 and took effect in 1972.

## 4. Fertility Decline and Population Waves

### *4.1. Family Planning Programme, Demographic Transition and Changes in Age Structure*

The family planning programme was launched in three phases, starting in 1971 in Java and Bali only, then expanding to include Sumatra in 1975, while the rest of the islands started family planning programmes in 1979. Since the early 1970s, the BKKBN (the Family

Planning Coordinating Board) has conducted strong "advocacy" programmes emphasising small family sizes and legitimating contraceptive use. The use of modern contraceptives among Javanese married women increased rapidly from virtually zero before the 1960s, to 26 per cent in 1976. It was not until 1991 that national data on contraceptive prevalence was available from the Indonesian Demographic and Health Surveys. It was reported that contraceptive prevalence in 1991 was 49.7 per cent, and increased to 54.7, 57.4 and 60.3 per cent in 1994, 1997 and 2002-2003 respectively (CBS and ORC Macro 2003).

The constant increase in contraceptive prevalence showed that motivation to use contraception has not been constrained by the prolonged economic crisis since 1997, which led to an upsurge in the prices of basic goods and reduced the capacity of most Indonesians to meet basic needs. On the other hand, the ability of government to provide subsidized contraceptive devices and services for the poor was also decreasing. Thus, for the poor, the decision to obtain contraceptive services has to compete with decisions to meet other basic needs. The increasing rates of contraceptive prevalence indicate that small family size norms have been institutionalized among Indonesian women. The changes in childbearing behaviour have resulted in the decline in the Total Fertility Rate from 5.6 children in late 1950s to 2.3 children in the late 1990s. There has also been a shift recently in the modal age of childbearing from 20-24 years to 25-29.

### *4.2. The Demographic Transition*

The population dynamics during the last fifty years have changed the Indonesian age structure enormously. The birth of large cohorts of the fifties saw inflated generations entering the working ages and the parenting ages, and these will be the cohorts that will enter retirement from 2015 onward. Even though fertility rates have been falling rapidly, the impact of the cohorts of "baby-boom"[3] of the fifties on the population age structure has been noticeable since the late 1970s through to the new millennium, as indicated by the high proportion of the population at ages 0-14 years. The large number of births occurring

3. In comments at the workshop Pool criticised the misuse of this term in some contexts (e.g. when fertility levels were continuously high, then fell), but the sudden increase in births in Indonesia at this time certainly produced a boom.

when the TFR was high, then became inflated maternal cohorts when they themselves entered the reproductive period, and therefore larger numbers of births were born to them. This process kept on going until the impact of the fertility decline came into real effect in the late 1980s.

The impact of large maternal cohorts is shown by the evidence that, despite declining TFRs, the annual number of babies born increased significantly from 4.1 million babies between 1955-1960 to 4.8 million during 1965-1970, then increased further to 5 million a year for the period 1975-1985. After this there was a slow decline in the annual number of births showing the effects of smaller maternal age groups on the birth rate. The period 1980-1990 marked a swing in the dynamics of the Indonesian population as indicated by declining annual numbers of births to fewer than 5 million. Thus the annual rate of population growth also decreased from 2.1 to 1.8 per cent. The average number of children women had during that period was 3.3.

Currently, during the period 2000-2005, Indonesia is enjoying a slower population growth of 1.3 per cent per year. The Crude Birth Rate has fallen to only half the rate of the 1950s, with a TFR of only 2.3. The Crude Death Rate has also decreased further to seven per 1,000 population. Although the Infant Mortality Rate has declined markedly, there are still about 200,000 babies who die out of four million born each year. Indonesians now live almost thirty years longer than they did fifty years ago, with 65.8 years of life expectancy compared to only 38.1 years in the fifties.

These demographic changes have been accompanied by significant shifts in the age structure of the Indonesian population. The proportion of children aged 0-14 years increased to 40 per cent in 1980, whereas the proportion of older persons aged 65+ years remained small, under 4%, during 1950-1980, indicating that Indonesia had a young population structure over those thirty years. The family planning programme, which was initiated in the early 1970s, began to show its effect through declines in the birth rates. From this point onward the proportions at younger ages declined markedly further reshaping Indonesia into an older population. Thus the proportion of the population under fifteen years old declined rapidly to 30 per cent in 2000, while the number of older persons started to increase reaching 4.8 per cent of the total. The presence of high proportions of children under 15 years from the 1950s to the 1980s had placed a severe burden on the working population at that time. But dependency burdens have since

decreased from 80 in 1980 to 68 in 1990 and further to only 55 per 100 working-age population in 2000 (Table 1).

The second phase of the age-structural transition in Indonesia is a product of this demographic transition. In this phase the proportion of older people is increasing but at a slow pace marking only a small contribution to the dependency ratio. On the other hand the size of the working population is becoming larger and larger because of the increasing survivorship of the large birth cohorts of the past (Figure 2). This increases the responsibilities of the government and the private sector to increase employment.

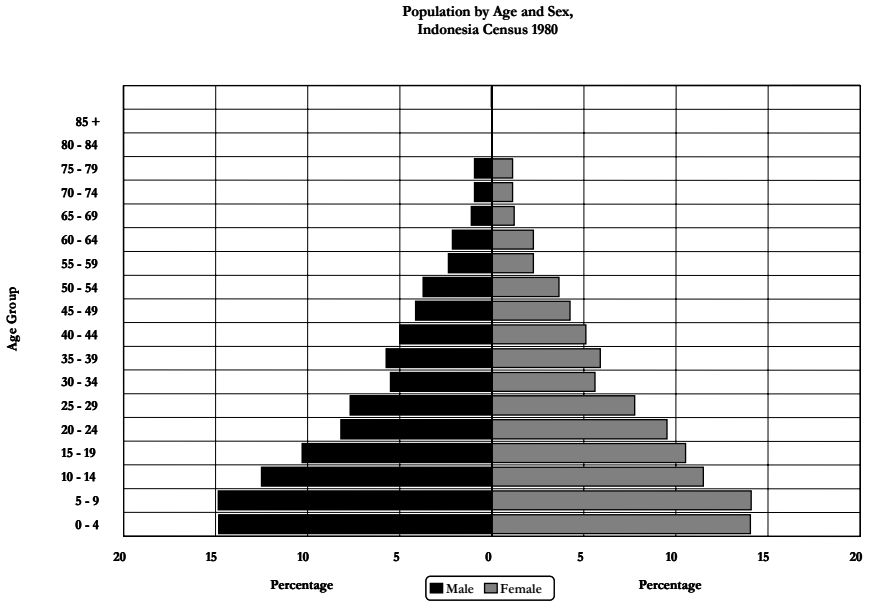
## 5. Towards Population Ageing

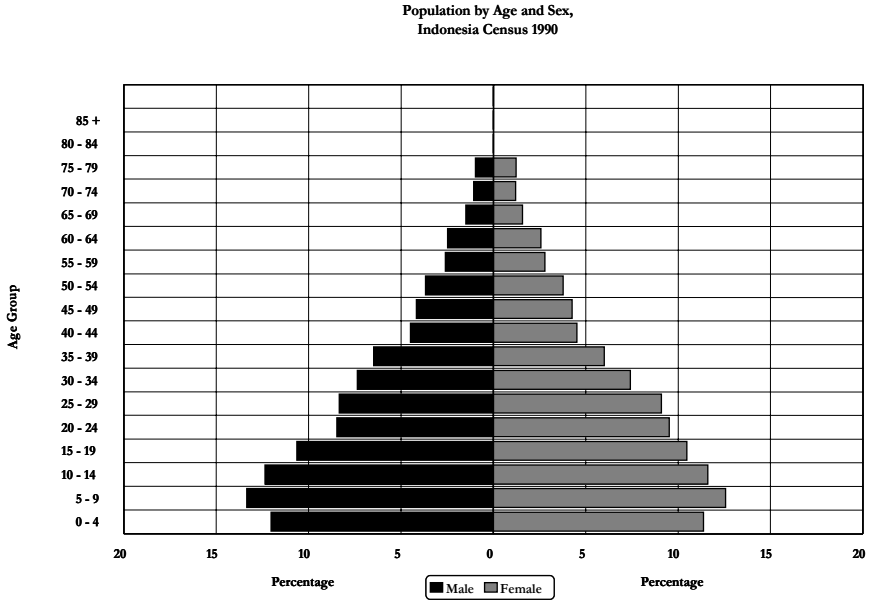
### *5.1. What Will the Indonesian Population Be Like over the Next Fifty Years?*

If fertility and mortality decline further, the age structure of the Indonesian population will be further reshaped, until fertility will reach a point where a woman will have only one daughter to replace her. The number of births will continue to decline while the number of deaths will rise slowly because of the rising size of older persons. This will go on until births almost equal to deaths, and if both rates remain constant for a long period the Indonesian population will finally reach a stable state. This would be an ideal condition in which the population would still grow but at a manageable rate. With a continuing fertility decline, a TFR already only 2.34 in 1997, Indonesia (CBS 2001a) will reach replacement levels (when one woman will be replaced by one daughter) between 2010 and 2015 and finally reach a stable population in 2050.

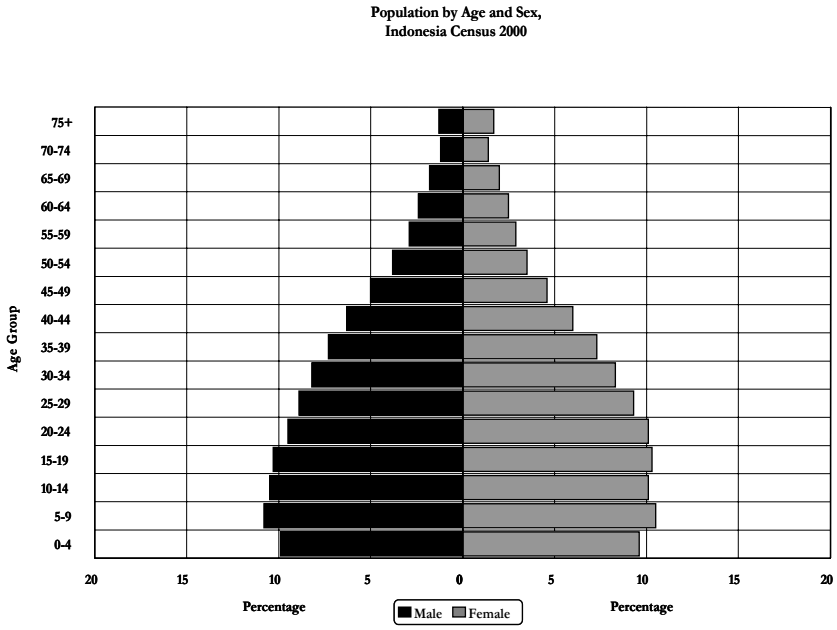
Table 2 shows that within the next fifty years the total size of the population will reach 300 million. This is still a huge population, even though the family planning programme has been successful in halting the rapid population growth of the past. By the year 2050, the demographic indicators and age structure of the population will be different from now, and very different from those of a century before.

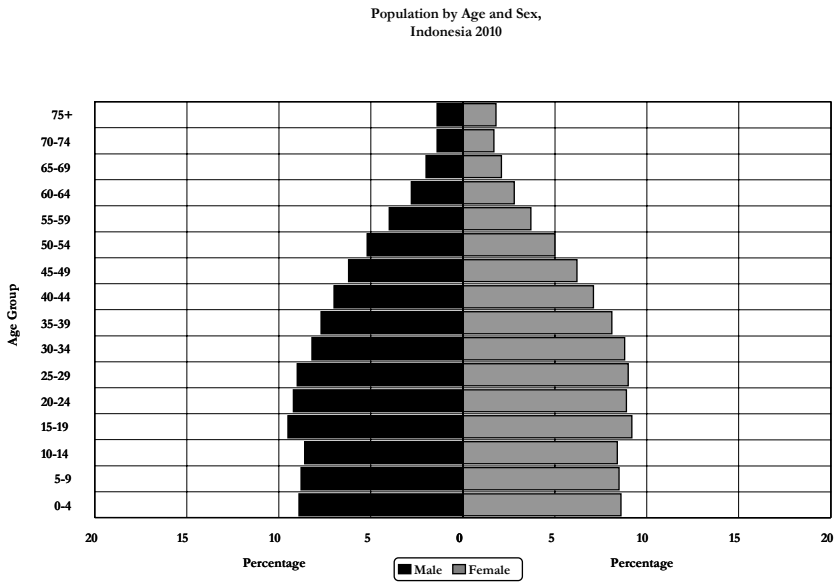
Figure 2
The population waves: Demographic transition, Indonesia
a) 1980-1990



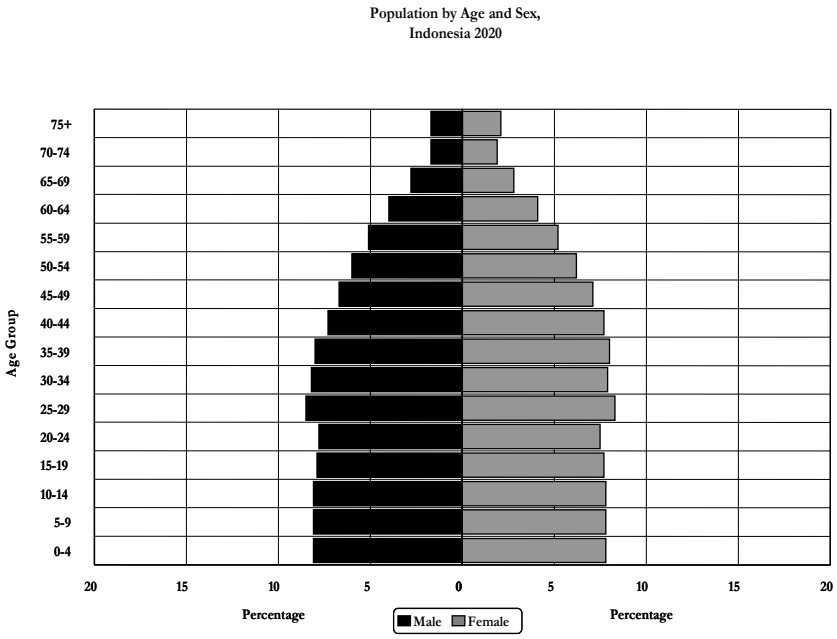



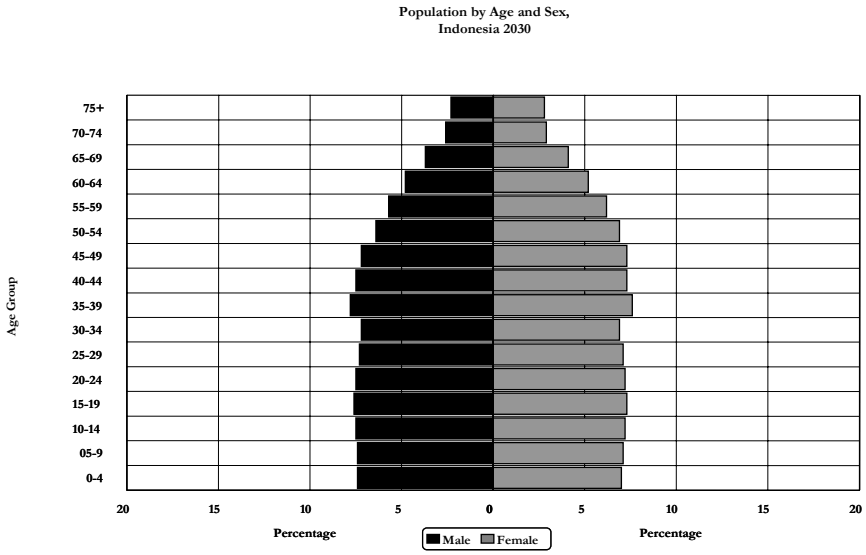
b) 2000-2010


Population by Age and Sex,
Indonesia Census 2000
Age Group
75+
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4
20 15 10 5 0 5 10 15 20
Percentage
Percentage
Male
Female

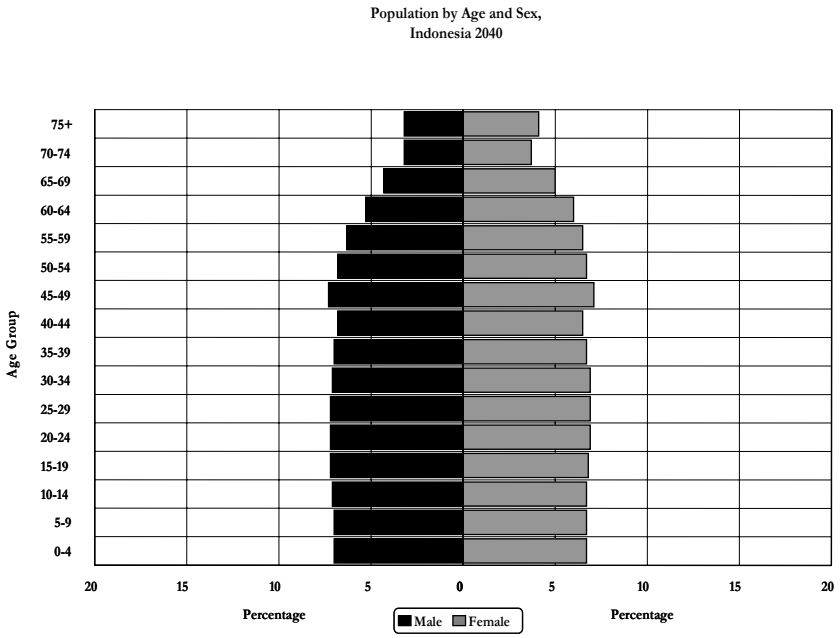

Population by Age and Sex,
Indonesia 2010
Age Group
75+
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4
20 15 10 5 0 5 10 15 20
Percentage
Percentage
Male
Female

c) 2020-2030


Population by Age and Sex,
Indonesia 2020
Age Group
75+
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4
20 15 10 5 0 5 10 15 20
Percentage
Percentage
Male
Female


Population by Age and Sex,
Indonesia 2030
Age Group
75+
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
05-9
0-4
20 15 10 5 0 5 10 15 20
Percentage
Percentage
Male
Female

d) 2040-2050


Population by Age and Sex,
Indonesia 2040
Age Group
75+
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4
20 15 10 5 0 5 10 15 20
Percentage
Male
Female
Percentage

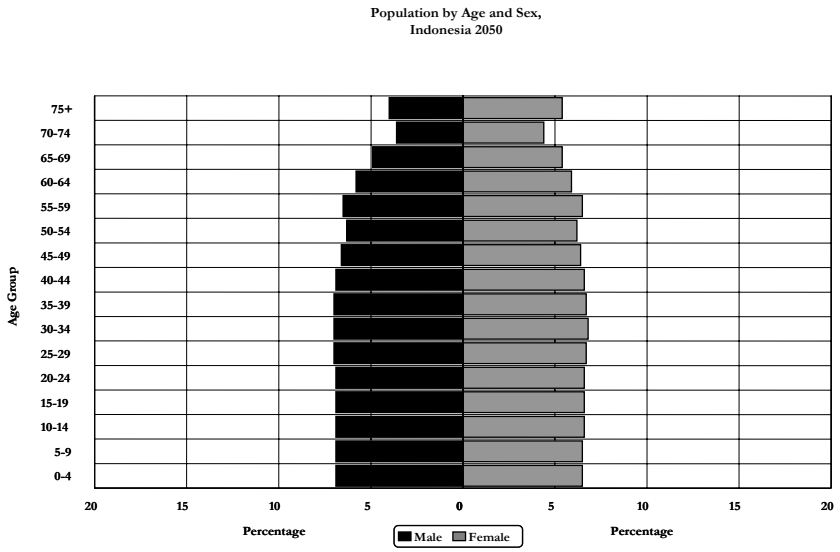

Population by Age and Sex,
Indonesia 2050
Age Group
75+
70-74
65-69
60-64
55-59
50-54
45-49
40-44
35-39
30-34
25-29
20-24
15-19
10-14
5-9
0-4
20 15 10 5 0 5 10 15 20
Percentage
Male
Female
Percentage

Table 2 — Indonesia population projection 2005-2050 based on UN *World Population Prospects - The 2002 Revision*

| | 2005 | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|---|
| Population (thousands) | 225,313 | 238,374 | 250,428 | 261,053 | 270,113 | 277,567 | 283,877 | 288,831 | 292,177 | 293,797 |
| Population change per year (thous.) | 2,751 | 2,612 | 2,411 | 2,125 | 1,812 | 1,491 | 1,262 | 991 | 669 | 324 |
| Female population 15-49 (thous.) | 62,102 | 65,703 | 68,507 | 70,113 | 70,949 | 70,885 | 70,202 | 69,100 | 67,708 | 66,304 |
| Population 0-4 (thousands) | 21,630 | 21,215 | 21,036 | 20,101 | 19,448 | 18,597 | 18,452 | 18,196 | 17,823 | 17,040 |
| Population 5-14 (thousands) | 43,035 | 42,907 | 42,573 | 42,030 | 40,787 | 39,415 | 38,040 | 36,970 | 36,230 | 35,549 |
| Population 15-64 (thousands) | 148,256 | 160,187 | 170,792 | 180,388 | 187,188 | 192,631 | 194,740 | 195,250 | 193,713 | 191,556 |
| Population 65+ (thousands) | 12,392 | 14,064 | 16,027 | 18,535 | 22,689 | 26,924 | 32,646 | 38,415 | 44,411 | 49,652 |
| Depend. ratio/100 working age | 51.98 | 48.81 | 46.63 | 44.72 | 44.30 | 44.09 | 45.77 | 47.93 | 50.83 | 53.37 |
| | 2000-2005 | 2005-2010 | 2010-2015 | 2015-2020 | 2020-2025 | 2025-2030 | 2030-2035 | 2035-2040 | 2040-2045 | 2045-2050 |
| Annual rate of increase (%) | 1.26 | 1.13 | 0.99 | 0.83 | 0.68 | 0.54 | 0.45 | 0.35 | 0.23 | 0.11 |
| Number of births per year (thous.) | 4,524 | 4,435 | 4,325 | 4,160 | 3,988 | 3,816 | 3,747 | 3,681 | 3,586 | 3,475 |
| Number of deaths per year (thous.) | 1,593 | 1,643 | 1,734 | 1,855 | 1,996 | 2,146 | 2,305 | 2,510 | 2,737 | 2,971 |
| Crude Birth Rate (per 1000 pop.) | 20.7 | 19.1 | 17.7 | 16.3 | 15.0 | 13.9 | 13.3 | 12.9 | 12.3 | 11.9 |
| Crude Death Rate (per 1000 pop.) | 7.3 | 7.1 | 7.1 | 7.3 | 7.5 | 7.8 | 8.2 | 8.8 | 9.4 | 10.1 |
| Total Fertility Rate | 2.35 | 2.20 | 2.10 | 2.01 | 1.94 | 1.86 | 1.85 | 1.85 | 1.85 | 1.85 |
| Net Reproduction Rate | 1.07 | 1.01 | 0.98 | 0.94 | 0.91 | 0.89 | 0.88 | 0.88 | 0.89 | 0.89 |
| Infant Mortality Rate (/1000 births) | 41.6 | 34.3 | 29.2 | 25.3 | 21.9 | 18.5 | 15.9 | 13.8 | 12.1 | 10.5 |
| Life expectancy both sexes (years) | 66.8 | 68.5 | 69.9 | 71.0 | 72.0 | 73.1 | 74.2 | 75.2 | 76.1 | 76.9 |

By 2050, the average number of children a woman will have (Total Fertility Rate) is projected to be less than two, leading to a much lower number of births (3.5 million babies or fewer per annum). The number of deaths will go up due to the increasing number of older persons, resulting in a lower increment of 504,000 people per annum during 2045-2050, and during these years, only 10 infants out of 1000 births will die before reaching their first birthday. If this is the case, this will be a remarkable achievement because these days, we still experience 4.52 million births and 1.59 million deaths per year, resulting in an additional population of 2.93 million each year. The estimated Crude Birth Rate and Crude Death Rate will be 11.9 and 10.1 per 1000 population respectively, so the rate of increase annually will only be 0.11 per cent by the year 2050 (Table 2).

This very low level of population growth may signal a return to patterns of population change occurring in the past. But then this was a result of high birth and death rates because of the very poor social and economic conditions existing before the demographic transition had occurred. The population of the future will be characterized by similar levels of population increase, but coming from low birth and death rates typical of a developed country situation. In part, the other projected demographic indicators will be comparable to levels seen in wealthy nations. But considering the current level of welfare of Indonesian people, it is not clear yet whether the standard of living will increase to the same level as those of people in developed countries. However, the demographic situation could be an ideal one in which to foster human development. But to do so it will be essential to improve the quality of human resources so as to meet ever-increasing aspirations and more expensive lifestyles, and to respond to the increasing demand for qualified workers in the forthcoming era of high technology and globalization of the economy.

### *5.2. Age Structure and Dependency Ratio*

As fertility continues to decline, the percentage of the population under 15 years will decline further until dependency drops to low levels. This will occur between 2010 and 2040 with levels below 50 per 100 working people, and reach its lowest point during the period 2020-2030 when the ratios are under 45 per 100 (Table 2). Thus a period during which what is called a "demographic bonus" will occur during

the decades 2010-2040, most significantly between 2020-2030, a span of only 10 years. In the meantime more and more people will live longer with life expectancy at birth reaching 77 years in 2050. Starting in 2040 the dependency ratio will increase again very quickly to reach 53 per 100 working population in 2050, half of it contributed to by persons 65 years and older. At that stage, the size of the young population will be equal to that for older persons, with each of these two age groups comprising 50 million people.

At that stage every two working-age persons will have one dependent. If the pattern of living arrangements does not change significantly, the increasing number of older persons will increase the number of households with three generations under one roof. However,[4] changes in the characteristics and life styles of young people of today, who will be parents over the next few decades, are such that it is highly unlikely that they will respect the same values and take responsibility for their parents' welfare as well as accommodating them in their homes.

Nowadays young people are facing many challenges. Beside globalization and rapid increases in information technology, in the domestic sphere human resources are still of low quality and face shortages of employment opportunities. On the other hand, modernization and the rapid spread of information technologies have increased aspirations for higher levels of living, yet incomes are not moving upward. Thus, it is also highly unlikely that the young adults of the future will have the opportunity to continue transferring some of their incomes to their parents. Meanwhile, daughters who usually take care of their parents will be more mobile, migrating to cities or working elsewhere in other countries.[5]

As has been experienced in developed countries, higher levels of expectation of life will increase the number of persons functionally disabled because they are at old ages. It is expected that older persons born in the 1960s and 1970s will suffer from impairments due to diseases contracted when they were infants, but will have survived to older ages because of improvements in health care and medical technology. It is also expected that the "cohort of controlled fertility", the persons born since the 1980s, will have greater longevity because their

4. My own observation.

5. See the analogous situation in the Philippines in the paper in this Volume by Gultiano and Xenos.

parents were more educated and more knowledgeable in taking care of their infants' health. For the parents of that time, having only a few children helped this happen.

With increasing numbers of aged people in the coming decades, it is important to pay attention to the public-health consequences. Beyond this, however, the explosion of older persons will mean that the society will need to provide them with basic services, retirement centers, health care for chronic illnesses, and comprehensive reproductive health care including that relating to menopausal disorders, cervical cancer and prostate cancer for men.

### *5.3. The Working-Age Population*

From today, there will be an additional 60 million population at the working ages, to finally reach 190 million in 2050. Historically more than 70 per cent of the population 15 years and over has been in the labour force, partly because of the cultural norm that it is men who are responsible for a household's welfare. But as education for women increases, there has been a growing recognition that more and more women will enter the labour market. In 2000 the rate of female labour-force participation was double that forty years ago, while the percentage of women working in the domestic sphere decreased significantly, (Adioetomo, 2005). Female labour-force participation rates have increased significantly at a pace faster than those of men. Therefore, the working-age population will "feminise" because the increasing labour-force participation of women is expected to rise to more than 40 per cent in the future.

As educational enrolment increases, boys and girls stay longer in schools, not only finishing nine years of schooling, but achieving higher scholastic levels. Meanwhile, those who have already finished tertiary education strive for further achievement beyond tertiary education. These persons will delay their entry into the labour market. Further, there is a growing tendency for women to delay marriage and enter the labour market before building their families, and only a small portion of them prefer to work entirely in the domestic sphere looking after their family. For those who marry, having only a few children releases them from barriers to participation outside the domestic sphere.

Thus there will be a shift in the composition of the population in the labour market. The number of young workers below 25 years old

will decrease significantly, and the number of workers aged 25 years and higher will increase because of the influx of young adult population (male and female) and housewives into the labour market.

The remarkable increase in levels of educational attainment among Indonesians is a creditable achievement. But, improvements in the quality of human resources are also essential if the country is going to fit the requirements of future labour markets, which will be characterized by industrialization, high technology and information-communication-technology (ICT), and affected by globalization of trade, industry, finance and services. With the current relatively low level of quality of human resources, the majority of the Indonesians will not be able to compete with one another, let alone their peers from neighbouring countries.

The large cohorts with low levels of education born between 1950 and 1975, who are in the labour market today, will eventually exit it because of retirement, and will be replaced by younger cohorts with more education. This started in the 1990s when the first "fertility controlled" cohorts entered the labour market. But in their turn they will be followed by an influx of the next few cohorts with even higher education. Thus there is an opportunity for a better quality labour force.

The working-age population of 2050 will consist of cohorts born between 1986 and 2035. They are cohorts of the "small family size" era and therefore their education is better. An analysis made by Adioetomo (2005) found that almost all persons born in the 1980s had finished primary school, and, among these, 60 per cent continued on to junior school, while 40 per cent finished high school, so that the chances of their continuing on to tertiary education are quite high. Although girls still have to compete with boys to obtain admission to institutes that will permit them to gain equal levels of education, the gender gap in education at levels higher than primary school will soon disappear. Better education and quality of human resources will increase the pace of economic growth and produce better living conditions. Thus there is a hope that the future advanced stage of the demographic transition, indicated by lower birth rates, death rates and population growth will be accompanied by better living conditions, as indicated by wealth and health, longevity and better education.

There is, however, another side to this: the growth in the young adult population, here defined as persons aged 15 to 24 years. Although the percentage of young people in the total population has re-

mained constant at about 20 per cent from the 1950s to 2005 and will then decline to 12 per cent in 2050, the absolute number has grown from 15.9 million in 1950 to reach a peak in 2000-2010 of about 40 million, a figure which will be maintained for 40 years and will then start to decline to reach 36 million in 2050.

The number of women at reproductive age will also increase significantly from 57 million in 2000 to 66 million in 2050. While public services including primary health care and reproductive health services remain very important, there will be ample opportunity for the private sector to provide services for the middle class at an affordable cost. Increasingly, however, women prefer quality rather than quantity of services, so that the public sector will have to provide services for different age groups including those for older persons. The participation of the private sector in providing the services will support women to achieve better reproductive health status.

## 6. The Demographic Dividend and the Window of Opportunity

An evaluation of estimates and projections of the Indonesian population dynamics over a century from 1950 has led to the conclusion that the Indonesian population has been reshaped through a demographic transition since the 1980s. Based on past trends, there is a hope that the working population of the future will be better educated. Moreover, the older cohorts with lower education will exit from the labour force and be replaced by a younger labour force with better education. But a commitment to continually focus on improving the quality of human resources, especially for the young people who are to meet the labour demands of the future, must be accorded the highest priority.

Observations on trends in dependency ratios over a century highlight a period in which efforts in improving the quality of human resources could be highly effective in terms of resource and priority setting. As was stated in the previous section, this is because dependency ratios will reach their lowest level during the period between 2010 and 2040, dropping further in 2020-2030. At that time investments necessary to provide basic services for the non-productive population will also be on the ebb compared to the period before when the young dependent population was larger. Further, this will be an ideal time to promote development and social services before segments of the

working population become dependent, increasing the number of the older persons. But this opportunity is very slight, only a decade or two in a century. From there on, the dependency ratio increases again.

Thus it is highly important for the leaders, now and in the following decade, to really prepare to benefit from this "window of opportunity" to improve the quality of human resources for the future. High investment in human capital, including education, health and other social services should be planned carefully and implemented consistently. Failure to do this, to exploit the demographic dividend when there is an optimum ratio between the working and the dependent populations, will mean a big loss for the nation, and Indonesia may have to wait to be able to escape from demographic crises.

## 7. Challenges Ahead

Meeting the challenges necessary to manage and thus exploit the "window of opportunity" in the next decade and a half is only the first stage. Indonesia has other challenges in front of it.

The lesson learned from the process of age-structural transition in Indonesia is that once a country has experienced an influx of large birth cohorts, the population will grow continuously into the foreseeable future – this is a momentum effect. It will be reinforced when, with declining mortality, the pace of fertility declines cannot match the effects of those decreases, and thus population increase and intense momentum is unavoidable until a strong effort to halt population growth is undertaken. Indonesia took that step, but this momentum carries forward growth even after fertility drops down towards replacement.

Eventually, however, the process of demographic transition that Indonesia is experiencing will reach an advanced stage, when the rates of fertility and mortality will resemble those of developed nations. This demographic transition has implications relating to the emerging age structures that will generate new challenges different from those of the past. The Indonesian population is heading eventually towards a more mature population structure, with declining proportions of children and increasing numbers of young adults and people at prime ages. After the 2020s, however, the rate of aging of the population will increase faster, producing an increased dependency burden on the working population.

The labour force that will have been the focus for development policies during the period of the "window of opportunity" will still be important, although its size will be smaller than at its peak in 2040 (see Table 2). Nevertheless, it will still be numerically powerful. The key problem will have been how to provide this generation with decent meaningful employment so that it will be able to accumulate savings to optimize the period of the window of opportunity when the dependency ratio is lowest, before it rises again because of increases in the size of the older population. That is, not only will Indonesia need to ensure that in the "bonus" period these people are working, but that labour-force productivity increases so that the country can respond adequately as dependency rates increase again.

The possibility of employment creation in the formal sector is not very positive for Indonesia, especially since the economic crisis of 1997. This crisis produced a massive economic contraction of 16% from the period prior to this, 1980-1995, when growth rates had reached 5-7 per cent. Over the last couple of years, there has been a sign of economic recovery, with four per cent growth, but this is still far below the rate achieved before the economic crisis. Besides, the economic crisis has also resulted in political and social disturbance threatening national security and the political stability of Indonesia. Foreign direct investment has been the lowest over the last five years, while existing multinational companies have moved their factories to other places that are safer and have cheaper labour costs.

But even before the economic crisis, employment creation had not been very successful. This is indicated by the fact that although the economic growth considerably exceeded the rate of population growth, the absorption of labour by the manufacturing sector was much lower than increases in the share of industry for GDP (Table 3).

During the period of high economic growth Indonesia enjoyed the growth of its modern sector, especially manufacturing and finance. But labour absorption in this sector is not that high (Table 3). In contrast the share of agriculture and forestry to the GDP is decreasing, but the percentage of persons working in this sector has remained high. The trade, hotel and restaurant sector does not show any progress in its share of GDP but labour absorption increased significantly during 1998-2000. This means that more and more people work in a stagnant sector.

Table 3
Trends in Gross Domestic Product and labour force share by industry, Indonesia 1980- 2000

| Industry | Per cent GDP share by industry (1993 prices) | | | Per cent of persons working by industry | | |
|---|---|---|---|---|---|---|
| | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 |
| Agriculture and Forestry | 25.3 | 19.8 | 16.7 | 56.3 | 50.4 | 44.2 |
| Mining and Quarrying | 16.4 | 10.5 | 9.4 | 0.7 | 1.0 | 0.7 |
| Manufacturing Industry | 12.0 | 20.6 | 26.4 | 9.1 | 11.5 | 12.2 |
| Electricity, Gas and Water | 0.7 | 0.8 | 1.6 | 0.1 | 0.2 | 0.1 |
| Construction | 5.9 | 6.0 | 5.9 | 3.2 | 4.1 | 3.9 |
| Trade, Hotels and Restaurants | 16.1 | 16.6 | 16.0 | 13.0 | 14.8 | 19.9 |
| Transport and Communication | 6.0 | 6.6 | 7.3 | 2.8 | 3.6 | 5.3 |
| Financial Institutions | 5.7 | 7.8 | 6.8 | 0.5 | 0.9 | 1.4 |
| Community and Public Services | 11.4 | 10.9 | 9.5 | 13.9 | 13.1 | 11.8 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Source: CBS, GDP statistics and population censuses, various years.

In absolute terms the number of employed persons has increased remarkably from 51.2 million in 1980 to 87.6 million in 1998[6] (CBS 1998). But the proportion of those working in the formal sector was only 35 per cent, and the others have to create their own employment in the informal economy. In 1998, 83 per cent of workers in trade, hotel and restaurants worked in the informal sector. They are among other jobs petty traders, food vendors, etc. Even in manufacturing, 36 per cent of workers are from the informal economy such as cottage industries, home workers, etc. Workers in the informal sector are characterised by low incomes, high uncertainty and lack of social security.

This situation is closely related to the low quality of human resources of its workforce. Sixty per cent of Indonesian population above 10 years of age have primary education only. Thus, Indonesian human resources are characterized by low levels of education and a low skill-base. The implementation of compulsory six years of education has been very successful with almost universal enrolment for children

6. In the census work is defined as job that is done at least one hour a day, thus the number of employed persons includes those working less than 45 hours per week.

at primary school age, and since 1996 this has been expanded to comprise nine years of education. However, the hope of achieving a universal nine years of education in 2004 seems to have been wiped out by the economic crisis which actually led to decreases even in the primary school enrolment rate, from 98% in 1998, to only 92% in 2002. This low quality of human resources will still be a factor in the workforce in the coming decades.

Who are the unemployed? When social security does not exist, very few people can afford to be unemployed. Thus the unemployed persons are usually young people, who have dropped out from school and are first time job seekers. They were born in the period of high fertility in the past, but even when fertility declined births still remained high about 4-5 million per year, as shown earlier. This resulted in about 2.5 million additional job seekers per year. In 2000 about 9 million people were unemployed (CBS 2001b).

Given this stark reality, the demographic bonuses that were identified earlier in this chapter seem to be more of a concept rather than a reality. However, this still carries an important message for the current and future policymakers in Indonesia: the need to raise concern about human-resource development (*through high quality programmes of education*) to compete in global markets. What is important now is how to continue efforts in family planning to ensure that fertility remains low.

Even with quasi-stationarity achieved around 2050, the size of the population will still continue to grow slightly (Table 2), with different needs and problems at each age group. The number of children under 15 years old will have to compete with the older population to obtain the resources for their basic needs.

## 8. Population Conditions in 2015 and Challenges if Indonesia Is to Meet the Millennium Development Goals (MDGs)

The period of bonus also coincides in part with the decade covered by the United Nations MDGs. For Indonesia, this means not merely laying down the bases for the longer-term future during this period, but also determining whether the country can meet the challenges the MDGs raise for nation-states and global civil society.

An evaluation relating to the achievement of the MDG targets in 2015 can be made here by making the assumption that a TFR of 2.1

can be realized by 2015. Under this assumption the population of Indonesia will reach 250.4 million in 2015, with the number of women at reproductive age being 68.5 million (Table 2). The AST has resulted in a decline in birth numbers per year, but there will still be about four million. By definition the Total Fertility Rate will be at two children per woman resulting in the downsizing of average household sizes, from six children in the early 1970s to two only in 2015. The ASTs also have the effect of increasing the ages of children in households, indicated by a dip in the dependency ratio below 50 per cent from 2010. The AST will allow Indonesia to experience a "window of opportunity" starting in 2010 and reaching its most advantageous level in 2020-2030. This means that the exploitation of these momentum effects should be accompanied by careful preparation of relevant policy and strategic actions, geared toward the achievement of the MDG targets by 2015.

An evaluation of whether or not Indonesia will be able to achieve the MDG targets by 2015 and their challenges is based on trends for country indicators of MDG achievement published in the Human Development Index 2003 (United Nations Development Programme 2003).

*Goal #1, Eradicate Extreme Poverty and Hunger*

The efforts of the Indonesian government to reduce the number of people living under the poverty line were very successful until 1997, when the economic crisis hit. This crisis increased the number of poor people living on less that $1 a day to 7.2 per cent of the total population by 2001. Meanwhile the share of national consumption by the poorest 20% was only 8.4 per cent. To meet MDG 1, Indonesia will need to see decreases in its family sizes so that parental dependency burdens can decline.

Nevertheless, as shown earlier, Indonesia is making progress in its economic recovery with about 4 per cent growth during the last two years. It is hoped that this will continue in the coming years. But to halve the number of poor people by 2015 will need strong commitment, efforts and resources, above all to provide employment for the 170.8 million at working ages. A positive outcome of family planning will be the reduction of household sizes to two children per woman in 2015, which would be accompanied by a decline in the absolute number of births and a dip in the dependency ratio to below 50 per cent.

*Goal #2, Achieve Universal Primary Education*

School attendance was the focus of the government's policy issued in a Presidential Edict (1973) to build a primary school in every village in Indonesia. This resulted in universal primary education being achieved by 1990-1991, with about a 98 per cent Net Primary Enrolment Ratio. But again, the economic crisis reduced this enrolment ratio to only 92 per cent in 2000-2001. However, the percentage of children reaching grade 5 increased from 84 per cent in 1990-1991 to 97 per cent in 2000-2001, while youth literacy (15-24 years) also has increased from 95 to 98 per cent by 2001. Thus, Indonesia is somewhat ahead in education; however, efforts to increase educational attainment should also focus on increasing the quality of human resources. The window of opportunity during which the dependency ratio will reach its lowest point should permit the government to increase resources for education and improve the quality of human resources. An influx of new cohorts of parents with better education and health (cohorts of 1980 and later) toward 2015 will also support this effort.

*Goal #3, Promote Gender Equality and Gender Empowerment*

The country's efforts to improve gender equality and gender empowerment have been praised for their successes. The gender gaps between boys and girls in primary and secondary education have almost disappeared, with a 0.95 to one ratio of girls to boys in school, both in the primary sector (1990-2001), and the secondary (2000-2001). Thus the MDG target to eliminate gender gaps by 2005 for both primary and secondary education has been accomplished. The gender gap in tertiary education still persists, but is disappearing. The window of opportunity, which will start in 2010, will permit parents to increase the enrolment of young women in tertiary education. Gender biases in the utilisation of household resources are also disappearing due to an increasing awareness of the importance of school for girls.

*Goal #4, Reduce Child Mortality*

The 2002-2003 Indonesian Demographic and Health Survey – IDHS (CBS and ORC Macro 2003) – reported that the Infant Mortality Rate for the period of 1998-2002 was 35 per 1000 births and the under-five mortality was 45 per 1000 births. These rates had declined

from, respectively, 59 and 79 per 1000 births during 1988-1992. This means that during the last decade Indonesia was able to reduce infant and child mortality by 40 per cent. The MDG target in 2015 is to reduce child mortality by two thirds of the level in 1990 or 26 per 1000 live births in 2015. This target will be achieved between 2008-2012. How can this be done? In general mothers contributing to child mortality are those aged 20-29 years old. In 2015 these mothers are born between 1986 and 1995. These women belong to the cohort with higher education. The 2002-2003 IDHS reported that women with higher education are more likely to marry later, know or practice family planning, have ante natal care, have smaller number of children and have their children immunized. It was also reported that women with higher education have lower child mortality rate (CBS and ORC Macro 2003). Therefore, there is a high hope that the MDG target to reduce child mortality by two thirds in 2015 will be achieved.

*Goal #5, Improve Maternal Health*

The Indonesian Maternal Mortality Rate (MMR) is the highest in South East Asia. Estimates based on the sisterhood method, computed from several IDHS have shown Maternal Mortality Rates of 390 per 100,000 births between 1990-1994 (IDHS 1994), 334 between 1993-1997 (IDHS 1997) and 307 between 2002-2003 (IDHS 2002-2003). While the methodology and accuracy of maternal mortality estimates are subject to debate, the above estimates show a declining trend. However, the decline in the MMR over the last ten years was only about 21 per cent. The MDG target is to reduce by three quarters the MMR in 1990 to be 97 per 100,000 births in 2015. Given the slow decline in MMR within the last ten years, it is not likely that Indonesia will achieve the MDG target of an MMR reduction.

The peak childbearing age of women in 2015 will be 20-29 years (IDHS 2002-2003), thus the women are from the same cohort with the characteristics discussed in the last paragraph. While education seems to be the key driver in the reduction in child mortality, it is not the case with MMR. The determinants of the MMR are far more complex than that of child mortality. Public awareness on how to make pregnancy safer has to be the focus in reducing the MMR, meanwhile reproductive-health services have to be improved. Participation of family and community members should be strengthened.

*Goal #6, Combat HIV/AIDS, Malaria and Other Diseases*

The ASTs have increased the proportion of the population at adolescent and young adult ages. These are the ages which are vulnerable to HIV/AIDS infections through injectable drug use and unsafe sex. The impact of ASTs for Indonesia will still continue to increase the proportion of young people, and therefore to halt the spread of HIV/AIDS infections will need a very special effort.

*Goal #8, Develop a Global Partnership for Development*

Many countries will still experience an increase in the sizes of populations, even when efforts to continue fertility control persist. A challenge to meet most of the MDG targets is how to provide employment for the increasing proportion of young and working-age population. On the other hand, globalization in trade and finance requires high quality of human resources to be able to survive. Thus developing countries with large populations and low quality of human resources such as Indonesia will face challenges to meet the MDG targets, especially those around reducing poverty. But this will require strategic support from developed countries.

## 9. Conclusion

The demographic transition Indonesia has gone through in recent decades has changed the population age structure enormously, decreasing the proportions at childhood ages but increasing rapidly the size of the working-age population. This has major social and economic consequences for the government and the private sector.

This is only one aspect of change. This paper has analyzed causes and impacts of ASTs over a century using empirical data from 1950-2000 and population projection from 2000 to 2050 (UN World Population Prospects, medium projection). Three phases of population momentum were observed:

*Phase I:*

A first stage of "waves" occurred, resulting from a long period of warfare and strife. But mortality had already started to decline before the 1950s, whereas fertility remained high. The large birth co-

horts around 1950 were, however, a return to pre-war levels of high fertility, after the Second World War and the Indonesian struggle for independence.

*Phase II:*

This is a second phase that also involves Population Waves, but for a different reason. Fertility started to decline at a considerable speed as a result of a successful family planning programme. This phase of the demographic transition occurred from 1975 and reached its peak in 1980-1990 resulting in the growth of the young adult populations and also the rejuvenation of the working age group. However, the number of babies born each year remained very high, after which the number started to decline, but very slowly. The dependency ratio was declining but was still weighted towards the young population aged less than 15 years.

*Phase III:*

A third phase, also one of waves is occurring today and will unfold in future carrying with it incipient indications of long-term ageing. The proportion of the population aged 65 years started to increase to 3.8% in 1990 and to 4.65% in 2000. It is expected to increase further to 16.9% or 50 million older persons in 2050.

The "window of opportunity" has been identified here to occur between 2020-2030, but only for a decade. At that stage the dependency ratio will fall below 45 per 100 at working ages. If the government were able to create enough employment opportunities carrying with them decent income, Indonesia could exploit a demographic bonus, because a large number at working ages with adequate incomes and high levels of saving (because the dependency burden is low) would induce increased investment in quality human resources.

In sum, the window of opportunity could bring a bonus to Indonesia. The realization of this will be heavily dependent on policymakers, but at present the possibility of this occurring looks very limited. Even assuming that the political will was there, a major problem lies in the low skills of the workforce.

**References**

ADIOETOMO, Sri Moertiningsih (2005) "Reshaping the Populations", in Hull, T H (ed), *People, Population and Policy in Indonesia*, Jakarta, Equinox Publisher: 125-168.

CBS (Central Bureau of Statistics) (1988) *Estimates of Fertility and Mortality. Results from the 1985 Intercensal Population Survey*, Jakarta: Central Bureau of Statistics.

CBS (1998) *The National Labour Force Survey, 1998*, Jakarta.

CBS (2001a) *Estimates of Fertility, Mortality and Migration. Results from the 2000 Population Census*, Jakarta: Central Bureau of Statistics.

CBS (2001b) *The Population of Indonesia. Results from the 2000 Population Census. Series L2.2*. Jakarta: Central Bureau of Statistics.

CBS and ORC MACRO (2003) *Indonesia Demographic and Health Survey, 2002-2003*, Calverton, Maryland, BPS and ORC Macro.

HUGO, J Graeme, HULL, Terence H, HULL, Valerie J and JONES, Gavin W (1987) *The Demographic Dimension of Indonesian Development*, East Asian Social Monograph, Singapore: Oxford University Press.

HULL, Terence H (ed) (2005) *People, Population and Policy in Indonesia*, Jakarta: Equinox Publisher.

UNITED NATIONS DEVELOPMENT PROGRAMME (2003) *Human Development Report 2003. Millennium Development Goals: A Compact Among Nations to End Human Poverty*, New York: Oxford University Press.

UNITED NATIONS POPULATION DIVISION (2003) *World Population Prospects,* New York: UN Population Division. http://esa.un.org/unpp.

WIDJOYO, Nitisastro (1970) *Population Trends in Indonesia*, Ithaca: Cornell University Press.

**Acknowledgements**

The author wishes to acknowledge Prof. Terence H. Hull, Dr. Valerie Hull, and Dr. Iwu Utomo from The Australian National University for the collaboration and exchanging experiences during the project, and the Ford Foundation who made this study possible.

# 7

# AGE-STRUCTURAL TRANSITION IN BRAZIL. DEMOGRAPHIC BONUSES AND EMERGING CHALLENGES

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***Abstract***

The paper describes the Brazilian Age-Structural Transition (AST) produced primarily by fertility declines (about 56% in 25 years). Slightly ahead of most of the Latin America countries, Brazil entered a stage in which strong, mostly positive, age-structural effects have been obtained. Some improvements relating to health, nutrition and education among children and youngsters, for example, were achieved in part because of the positive impacts on policy of the AST. Among the working-age population the mature population (aged 25 to 64), that usually has high activity rates and comprises the majority of taxpayers, will increase in relative and absolute terms while the *junior* segment (aged 15 to 24) – a proxy of those entering for the first time into the labour force – will probably have negative growth rates. Thus, the intra-working-age ratio (ratio of the junior labour force to the mature labour force, an indicator of pressure for new employments) has a downwards trend in Brazil. Different growth rates within the working-age population are there-

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fore a new demographic "window of opportunity". This bonus, however, can only be exploited if full employment and higher productivity are pursued. As a necessary, although not sufficient, condition to achieve social, economic and intergenerational balances, labour-force skills should be at their highest levels. For this reason, all opportunities to become skilled should be given to the potential workforce.

On the other hand, due to the AST, new challenges emerge for Brazilian society. The population aged 65 or more will expand. If current per capita government transfers are kept constant, the difference between age-related government expenditures and revenues will increase considerably and cause an unbearable increment in the fiscal deficit. Prospectively, any simulation about age-related government expenditures will produce the well-known scenario: that the elderly will demand massive resources, because of social security plans and because it is just at older ages that health care becomes more necessary and costly. The forecast fiscal crises caused by the ageing of the population combined with an unsound Brazilian Social-Security System should be a matter of concern for the Brazilian society.

Most of the policy implications identified for developed countries in relation to their ASTs decades ago are similar to those discussed in this paper; what is different, however, is the speed of present changes in several developing countries. It is extremely important in order to take advantage of the demographic bonuses and to prepare the society to face the new challenges to be aware of the short period to define, implement and accomplish plans, whatever they may be.

## 1. Introduction

The term *Age-Structural Transition* (AST) that has been promoted by the IUSSP Committee on Age-Structural Transitions and Policy (see for example Pool 2005), encompasses the changes produced primarily by fertility declines and thus in the sizes of birth cohorts. They are then mediated by shifts in patterns of survivorship, and in many populations by migration flows.

This paper focuses on the AST that Brazil is enduring and its consequences. The case of Brazil is particularly important, firstly, because the country itself may be considered a subcontinent. It is expected to comprise more than 180 million inhabitants by 2005, thereby representing about a third of the total population of Latin America and the

Caribbean.[2] Secondly, a fertility transition is well advanced in all regions inside the country. These simultaneous shifts have occurred because all regions have the same history and culture – where the Portuguese language is almost universal – and have taken place despite extreme socioeconomic and geographical inequalities.[3] There is a wider context for this: although Brazil is going through impressive age-structural changes, most of the Latin American countries are experiencing similar fast changes. It is probable that those that are delayed in this process will pass through an even faster change as pointed out by Fígoli and Wong (2003). Thus, Brazil is an example of the demographic changes sweeping across in Latin America.

Data used to describe the AST in Brazil are drawn mainly from the Population Division of the United Nations. Population projections and estimates for the next decades are, of course, subject to errors, but at the same time, there is little room for significant changes in the hypotheses behind the projections. *Ceteris paribus*, fertility will not return to previous levels; indeed, recent projection revisions have shown that fertility levels have frequently been overestimated. It can be assumed that mortality rates, despite the paucity of reliable data on adult mortality, will continue to decrease unless there is an upsurge in devastating diseases. Finally, international migration may lead a need to modify the forecasts, but even in this case, this would not cause dramatic changes in the projections for the following one or two decades.

The paper describes, firstly, the demographic transition that Brazil is undergoing; secondly, using secondary data, some perspectives of the probable government expenditures given the future age pattern are presented. Lastly, social demands of the different age groups, the challenges that the AST poses and alternatives to face those challenges are considered.

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2. The Brazilian territory has more than 8.5 million km$^2$ (equivalent to about 90% of the USA's land surface). While part of the North and Northeast areas are located above the Equator in the rain forest, an important share of the Southern part is located well below the Tropic of Capricorn.

3. Map 1 in annex shows the wealth distribution across the Brazilian territory in terms of GNP per capita; clearly, the Southern area concentrates the highest values, the poorest performance corresponds to the Northeast region and some areas of the extreme North region.

## 2. The Age-Structural Transition in Brazil

Between the 1940s and the 1960s, a major part of Latin America's population experienced a significant decline in mortality, whereas fertility was relatively constant. This resulted in a quasi-stable population. Following this, however, the onset of the fertility decline initiated a deep change in the age distribution that will produce structures over the medium and long run that will be similar to those of some highly populated Asian developing countries that also have gone through impressive demographic changes.

This change in the case of Latin America and the Caribbean (LAC) may be seen through the age distributions presented in Figure 1, and through variations in the median ages (M) of different populations. M increased in LAC about 6 years between 1965 – when emerging demographic changes were still not yet reflected in the age structure – and 2000.[4] Brazil has experienced an even faster age-structural change than the entire LAC, as shown by the evolution of the pyramids in Figure 1, and this difference with the rest of LAC will probably be wider over the next decades. In fact, the Brazilian median age (25.4 in 2000) increased by more than 7 years during the period 1965-2000; during the same 35-year period, European countries also aged, albeit at slower pace. Besides, by 2050, the Brazilian age pattern (with M=41.2) will be older than the current average in Europe (M=37.7 in 2000).[5]

Brazil's demographic change has been caused by a particular combination of trends in fertility and mortality. That said, the influence of the former is the more important.

The onset of the Brazilian fertility transition had taken place by the end of the sixties. The Total Fertility Rate (TFR) dropped from 6.2 to 2.7 children per woman over the period 1965-1990. Figure 2 shows this fast decline, equivalent to 56% in 25 years. Although extreme so-

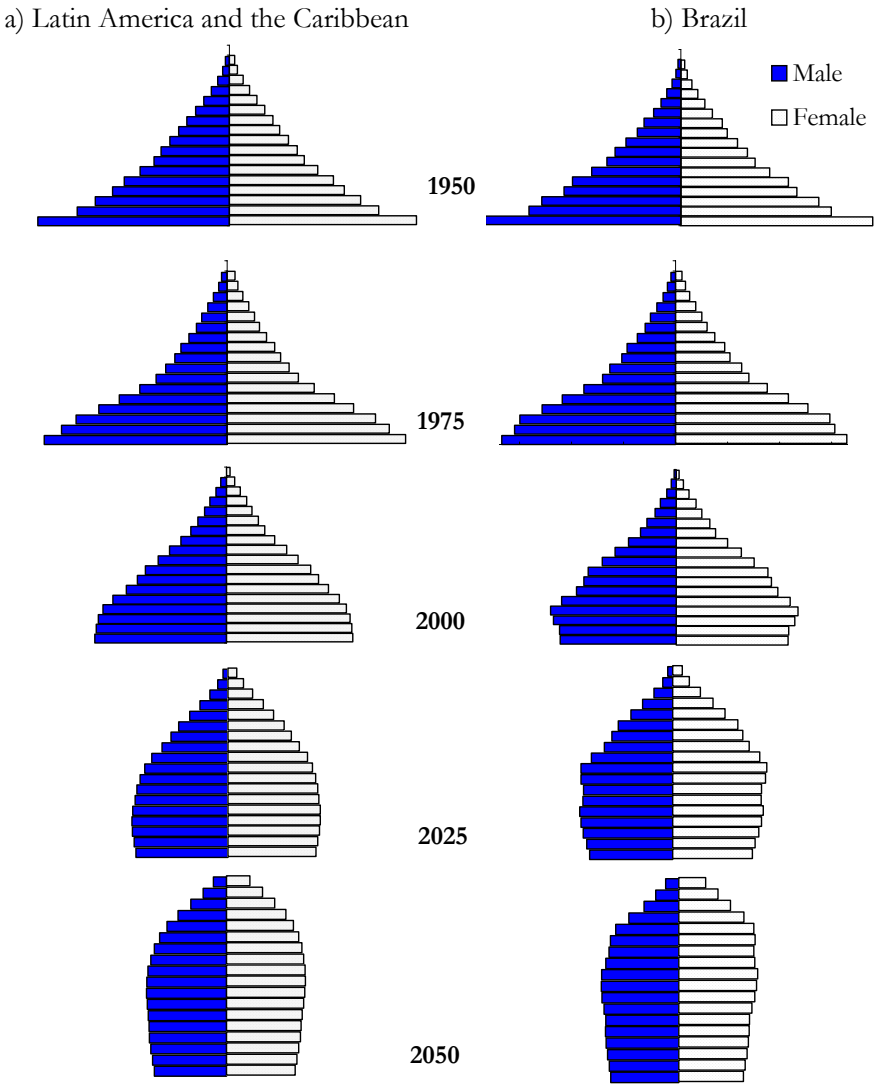
4. Increases in the median age (M) of the total population according to United Nation (2003) are as follows:

| Region | Increases in M (in years) | | | M (2050) |
|---|---|---|---|---|
| | 1965-2000 | 2000-2050 | Total increment | |
| Europe | 6.8 | 10.0 | 16.8 | 47.7 |
| Latin America and the Caribbean | 5.6 | 15.5 | 21.1 | 39.8 |
| Brazil | 7.2 | 15.8 | 23.1 | 41.2 |

Source: Raw data from United Nations 2003.

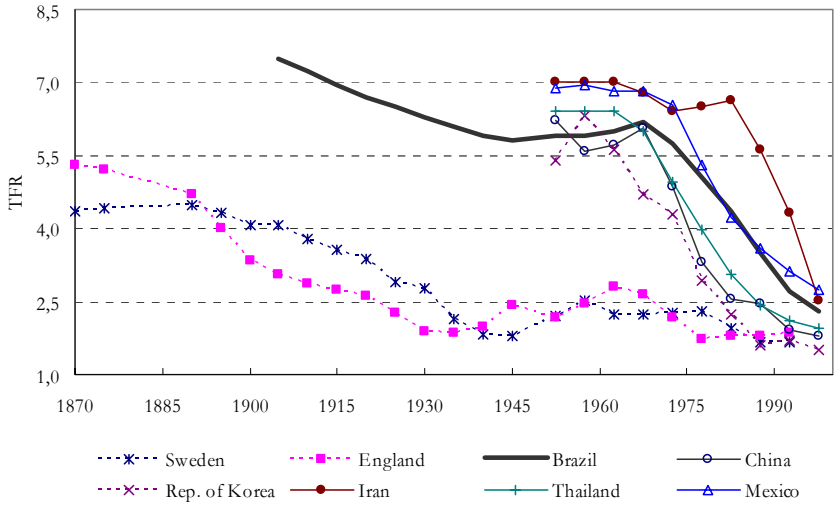
5. Notice in addition that no Western country had an M above 41.0 in 2000.

Figure 1
Latin America and Brazil, 1950-2050: Population by age and sex
(relative distributions)




Source: Raw data from United Nations 2003.

Figure 2
Sweden, England, Brazil and selected developing countries:
Total Fertility Rate for selected periods




Source: Carvalho and Wong 1998, and United Nations 2003.

cioeconomic and geographic inequalities delayed the onset in the less privileged regions of the country, estimates using data from the 2000 demographic census indicate that replacement has almost been reached in most of the territory. Indeed, the rate of fertility decline has been even faster in the less developed regions.[6] The national TFR was around 2.3 in 2000.

The magnitude of the general decline of fertility in Brazil over such a short period of time is, on the one hand, surprising when compared with the experience of developed nations. It is known that most European countries took about a century to complete their fertility transition, and countries like Sweden and England, for instance, took about six decades (approximately from 1870 to 1930) to bring down their levels by about 50%. Brazil, instead, experienced a similar decline in just a quarter of century. On the other hand, this speedy decline is

6. The Northeast Brazilian Region, that has around 50 million people, approximately 30% of the Brazilian population, and traditionally bears the less favourable socioeconomic conditions, had a 50% reduction in the TFR in a 15-year period (from 6.1 in 1980 to 3.0 in 1995). A similar fast decline was observed in the North Region (Wong 2000).

by no means unique to Brazil. Countries with different cultures and sociopolitical organization and, above all, with different population policies and family planning programs (ranking from compulsory regulation to no policy at all, which was the Brazilian case) have experienced similar changes in their fertility levels over approximately the same durations.[7] Some examples are Thailand, South Korea, Iran, China and Mexico (see Figure 2).

Prospectively, there are no signs of recovery for Brazil,[8] and, according to United Nations estimates, it will correspond to Brazil having the lowest South American level for the period 2000-2025 (United Nations 2003). Furthermore, cohort estimates suggest that, by 2005, the TFR might be definitively at replacement level. Beyond this, there are no indications that fertility will stabilize around 2.0 children per woman, and thus fertility might continue to decrease to well below replacement (Perpétuo and Wong 2003).

Mortality also showed a sustained downward trend that started in the better-off regions during the late thirties but sped up during the sixties (Camargo and Frias 2001), and in the process caused changes in the age structure. Children born during the fifties were expected to have less than an 80% chance of surviving up to age 15, while for the cohorts born at the beginning of the current century this probability rose to 95%. Impressive changes are noticed at adult ages: only half of the cohorts born during the fifties were expected to survive to retirement ages; in contrast, according to more recent life tables (Sawyer *et al.* 1999), about 80% of those born after the year 2000 are expected to reach old age.

International migration has had little impact on the age structure over recent decades; internal migration, in contrast, plays an important role in explaining regional age-structural changes. Intense internal flows at labour-force ages (which means sex and age selectivity) to the richer Brazilian southern areas contribute to exacerbate the ageing process in the sending areas. Areas where the onset of fertility transition took longer were, at the same time, the most important providers of working-age populations towards areas where the transition was

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7. It is worth noting that over the second half of the last century, Brazil did not have either official or unofficial population or family planning policies or programs.

8. A high prevalence of sterilization (BEMFAM 1997) will not allow, at least in the short run, any recovery of the fertility levels.

already underway. As a consequence, a number of relatively poor States, in spite of more recent fertility declines, ended up with older age structures. In addition, there were new internal migration flows oriented towards medium-size cities that had commenced before the dawn of the new century. These new flows will probably accelerate because the absorptive capacity of the traditional destinations that are now megalopolises has been exhausted. This paper does not consider AST within different Brazilian regions, but it is important to note that this emerging pattern will probably have different impacts on the age structure of the sending and receiving regions. It will also have important consequences for changes in socioeconomic demands to be met by national policies.

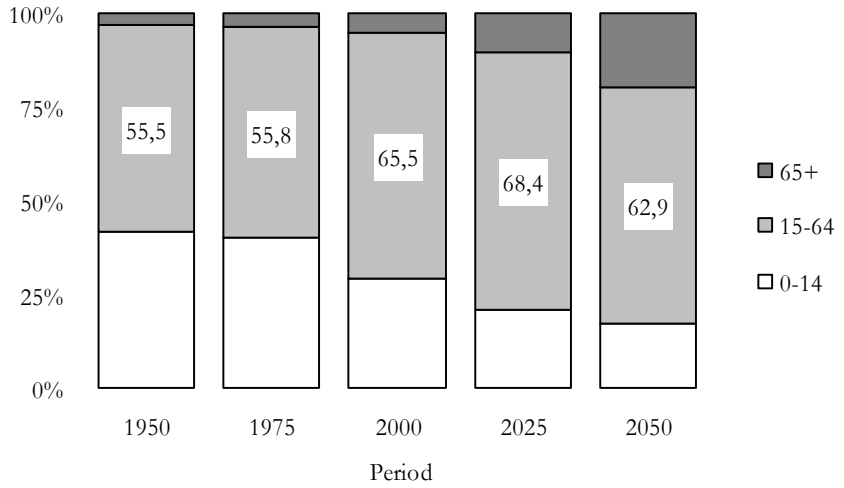
### *2.1. The Age Structure*

A combination of changing trends in fertility and mortality affected the quasi-stable population structure that Brazil experienced until the seventies. Thus a drop in the proportion of children in the Brazilian population, mainly as a consequence of fertility decline, decreased the share of the total comprising children under age five years from 15% to 11% between 1970 and 1990. Similarly, age group 5-9 years saw its share drop from 14% to 12%. Proportions at these ages continued to drop until 2000, when, besides a decrease, the sizes of both age groups became very similar (each of them sharing about 9% of the total population). Thus the age structure started to get rid of its pyramidal look, and a rectangular shape is emerging as an additional indication of the ageing process (Figure 1). Complementarily, older age groups increased their share. The population aged 60 years or more, for example, increased from 5.1% in 1970, to 8.6% in 2000.

#### 2.1.1. The Inter-Age Relationships

An analysis of simple indicators measuring the share of the total found in three large age groups (less than 15, 15 to 64 and 65 or more), the Dependency Ratio (DR) and the Ageing Index (population aged 65 years or more/population less than 15) constitute a first approach to the study of inter-age relationships seen while the country is undergoing an AST. Figure 3 shows that the population distribution is changing mainly because of the shifts in shares at the extremes.

Figure 3
Brazil, 1950-2050: Age distribution of the population (three large groups)




Source: Raw data from United Nations 2003.

At the beginning of the period, in 1950, the share of population aged 65 or more was negligible. At the other extreme, however, more than 4 out of 10 individuals were under age 15. By 2050 the population over 65 years old will probably have a higher share (20%) than the young population (17%). Because of the same demographic dynamics – high fertility levels in the past and continuous improvements in survivorship – the intermediate group, those at the economically active ages, is still increasing. This age band will probably maintain a slow but continuous upward trend; after 2025 the share will be about 68%, when it will start to decrease. Absolute numbers, though, will continue to increase until the Brazilian population becomes nearly stationary, i.e., perhaps by 2050. In other words, despite the increase of the older population, there will be a long period of time during which the population at productive ages will be numerically and proportionally growing and so too will their role in the economy. The difference between populations at productive age and their dependents started to enlarge during the 1970s in relative terms. In addition, at its dawn the 21st century was undergoing an exceptional and continuous upward trend

in the share of the working-age population, and this will remain substantial even after reaching stability with no population growth (over 60% of the total at working ages).

The data in Table 1 emphasize the findings reported above. The Dependency Ratio (DR) and its components (Children Dependency Ratio, CDR, and Elderly Dependency Ratio, EDR) define more clearly the relationship between the different age groups mentioned earlier. The burden on the productive population (aged 15-64 years) had remained constant – and at extremely high values – until about the seventies when the dependent population (under age 15 and over 65) in Brazil were nearly half of the total population and more than 90% of them were children below age 15 (Carvalho and Wong 1998). The DR has been decreasing since then and in the population projections will continue to decrease until 2025. This downward tendency is a blend of two opposed trends: an increase in the absolute size of the older adult population and a decrease followed by stabilization of the population below age 15. It is worth noting that, on the one hand, the total DR will not recover the high levels it had at the beginning of the 20$^{th}$ century, although the EDR will increase twofold over the period 2000-2025 (or fourfold, if the period 2000-2050 is considered). On the other hand, the Potential Support Ratio (an index relating to those potentially able to support elderly people and calculated as the inverse of the EDR) will experience a sharp decrease after 2000, which is explained by a rate of increase in the size of the population aged 65 or more that surpasses the growth of the economically active age population.

Finally the Ageing Index, a measure that is more sensitive to variations in the age distribution since it only considers the two age groups that are affected in the ageing process, shows the velocity of the ageing process. Comparisons made by Moreira (1997) locate Brazil among those countries with the most acute increases of this Index in the near future. Over a 25-year period the Ageing Index will increase threefold over the ratio seen in 2000, to reach a level where there would be more than 50 adults aged 65 or more per 100 children below age 15. Before the end of the projection period, by 2045, the number of elder people would surpass the number of children.

Currently, if one considers the relationships between the three broad age groups, Brazil is benefiting from a demographic bonus. The country is achieving its lowest DR over the century 1950-2050, due to

Table 1
Brazil, 1950-2050: Dependency Ratios and their relative distribution and Ageing Index

| Period | Dependency Ratios (%) | | | Relative distribution of the dependent population | | | Potential Support Ratio (%)(4) | Ageing Index (%)(5) |
|---|---|---|---|---|---|---|---|---|
| | Total(1) | Children(2) | Elderly(3) | Total | Children | Elderly | | |
| 1950 | 80.3 | 74.9 | 5.4 | 100.0 | 93.3 | 6.7 | 18.6 | 7.2 |
| 1975 | 79.2 | 72.2 | 7.0 | 100.0 | 91.2 | 8.8 | 14.4 | 9.6 |
| 2000 | 52.7 | 44.8 | 7.9 | 100.0 | 85.0 | 15.0 | 12.7 | 17.6 |
| 2025 | 46.2 | 30.6 | 15.6 | 100.0 | 66.2 | 33.8 | 6.4 | 51.0 |
| 2050 | 59.1 | 27.6 | 31.5 | 100.0 | 46.7 | 53.3 | 3.2 | 114.1 |

(1) Dependency Ratio (DR) = Children Dependency Ratio (CDR) + Elderly Dependency Ratio (EDR).
(2) Children Dependency Ratio (CDR) = Population less than 15/Population aged 15-64.
(3) Elderly Dependency Ratio (EDR) = Population aged 65 or more/Population aged 15-64.
(4) Number of persons aged 15-64 per person aged 65 or more.
(5) Ageing Index = Population aged 65 years or more/Population less than 15.
Source: Raw data from United Nations 2003.

the expansion of the population at working ages (in absolute and relative terms), to a rapid decrease of the childhood share, and the relatively low growth rate as yet of the elderly population. According to Carvalho and Wong (1998), this structural situation is encouraging in two ways.

Firstly, in the short to medium term the small size of the current generations at childhood ages pushes down the DR, making it possible to re-orientate the direction of available resources from factors of quantity to those of quality. In addition, one might expect an increase in the per capita government expenditure on primary education when the negative growth in the number of youngsters stays for a long while. At the same time, the large proportions at working ages produce low dependency ratios either of child or elderly populations, that will reduce pressures on the current social welfare system, at least until the EDR enters the phase of fast growth. Slightly ahead of most of the Latin America countries, Brazil has entered into a stage during which, according to Behrman *et al.* (2001), some of the strongest (mostly posi-

tive) age-structural effects will be observed.[9] This situation certainly provides favourable conditions for the society to re-formulate its social security scheme and determine an ideal retirement strategy.

Secondly, the Elderly Dependency Ratio will be significantly high only from 2020. The children of today, who belong to smaller generations than those generations before them, will be the labour force of tomorrow, the cohorts who, in turn, will have to face growing elderly dependency ratios. The logical conclusion to all this is that the society vitally needs to invest in the current generation of children, particularly in areas of health and education. This is not only a matter of quality of life, but also because they (again, a part of smaller generations) will be needed to sustain the economy and to care for a rapidly increasing proportion at older ages.

### 2.1.2. The Growth Rates

The picture of the AST given by considering the three largest age groups can be better understood by studying trends in the annual average growth rate (*r*) for different narrower age groups (see Table 2 and Figure 4). Populations in groups 0-14 and 15-24 years, born after 1975 and, therefore, during the period of fertility decline, will grow during the first half of this century at rates well below the average value for the total population, and, except for the age group 15-24 between 2000-2005, their growth rates will be negative until the population becomes stable.

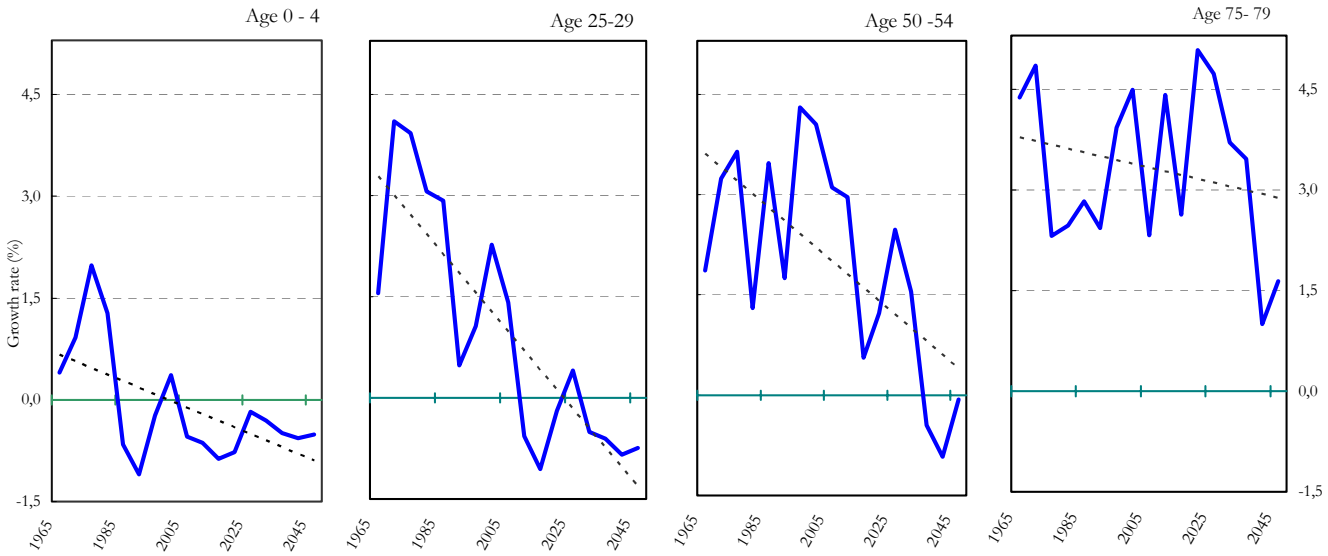
Table 2
Brazil, 2000-2050: Annual average growth rate,
total population and selected age groups

| Period | Total | 0-14 | 15-24 | 25-64 | 65-74 | 75 + |
|---|---|---|---|---|---|---|
| 2000-2005 | 1.2 | -0.32 | 0.38 | 2.26 | 3.04 | 4.84 |
| 2010-2015 | 0.9 | -0.26 | -0.65 | 1.60 | 3.68 | 4.27 |
| 2020-2025 | 0.6 | -0.75 | -0.06 | 0.73 | 3.86 | 4.50 |
| 2030-2035 | 0.4 | -0.41 | -0.73 | 0.38 | 1.90 | 4.46 |
| 2045-2050 | 0.1 | -0.52 | -0.22 | -0.42 | 2.14 | 2.27 |

Source: Raw data from United Nations 2003.

9. In the sense that countries having relatively large working-age populations and low DRs due to ASTs are expected to have relatively high productivity and save more (Behrman *et al.* 2001).

Figure 4
Brazil, 1965-2050: Annual average population growth rate
for selected age groups (per cent)




Source: Raw data from United Nations 2003.

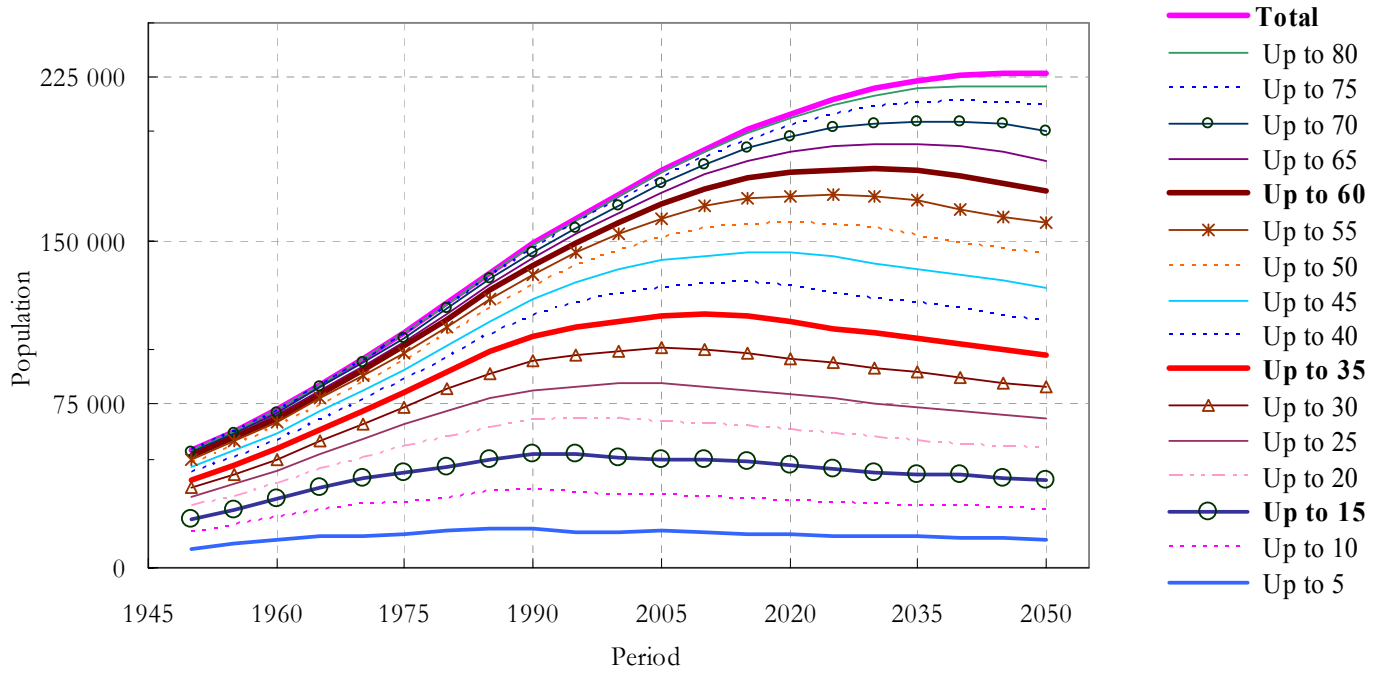
At the beginning of this present century, the population below age 15 years is experiencing negative growth. Those at ages at which further education occurs or at which people enter the labour force (at ages, say, 15-24 years), although still increasing, have growth rates below 0.5% and this will turn to negative growth over the next four decades. Those age groups at which participation in the labour force is centred (ages 25 to 64) are now expanding at growth rates over 2% and will continue to expand, but at decelerating rates. The size of population aged 25-64 (the bulk of the employed labour force) will stop increasing only from 2045. Finally, groups over age 65 grow at positive and high rates during the whole period. It is this pattern of differentiated values for the function *r* (lower for the young population, higher for the working-age population until 2025, higher for the older population) that necessarily produces a change in the age structure.

Figure 4 complements the above argument by showing the trend in *r* for selected 5-year age groups. Although in all cases there is a downward trend, the older the age group, the higher the growth rate between 2000 and 2050; and, below age 55, the younger the age group the sooner it will reach negative growth rates; the extreme old ages (75-79, for instance) will maintain their positive high growth rates.

### *2.2. The Size of the Brazilian Population*

The consequences of different growth rates on the absolute sizes of the different age groups is also an important issue to consider because, undoubtedly, the Brazilian population will continue to grow, despite the current fertility changes towards, as has been noted, below-replacement level fertility and negative growth rates at younger ages during the transitional period. The size of the total population until 2050 and the contributions of different age groups are presented in Figure 5. The cumulative values, similarly to those presented by Preston *et al.* (2001), allow a better understanding of the effect of the different growth rates. Between 2000 and 2020, 38 million people will probably be added to the total population, yet for children and youths, and even for parts of the adult population negative growth rates will prevail. During this period, the size of the population under age 30 years, born after the onset of fertility decline, would shrink by 3.4 million. Because of the waves, some younger age groups will show higher

Figure 5
Brazil, 1950-2050: Population cumulated up to the indicated age (absolute values in thousands)




Source: Raw data from United Nations 2003.

losses. For example, the size of the population under age 25 years will drop by 5 million.[10] Furthermore, the age group 15-34 (that includes women responsible for more than 90% of the current births) will face negative growth for the whole period 2010-2050; accordingly, the number of births will decline, even though fertility rates remain constant.

Finally, within the economically active age population (15 to 64 years), it is important to consider two groups. Firstly, the *mature* working-age population (ages 25 to 64 years: 75.5 million people in 2000). Its high growth rate implies an annual increment of between 2 and 1.5 million people over the first decade of this century. This important subgroup, representing nearly half of the total population, would continue to increase at least until 2045. Secondly, there is the *junior* segment of the economically active population (ages 15 to 24: 34.3 million people in 2000). This age group is a proxy for those entering into the labour force for the first time, but after 2005, will probably have negative growth rates. An important fraction (those aged 15-19 years) will usually be obtaining qualifications, and the other also important fraction (20-24), although *economically active*, will probably be unemployed, looking for their first job. The mature age group (25-64), in contrast, usually has higher activity rates and is composed of the most important taxpayers in the whole "active age" range.

When the working-age population is relatively young, unemployment tends to be higher and tends to lessen as the age structure shifts towards older ages (Behrman *et al.* 2001). The size of the *junior* group has increased in absolute numbers very rapidly until recently in Brazil (see Figure 6, left axis). Demographically speaking, by entering into the labour force they pressured the economy towards the creation of enough employment so as to avoid social or economic instability due to increasing unemployment, or because they take jobs from older people still at working ages.[11]

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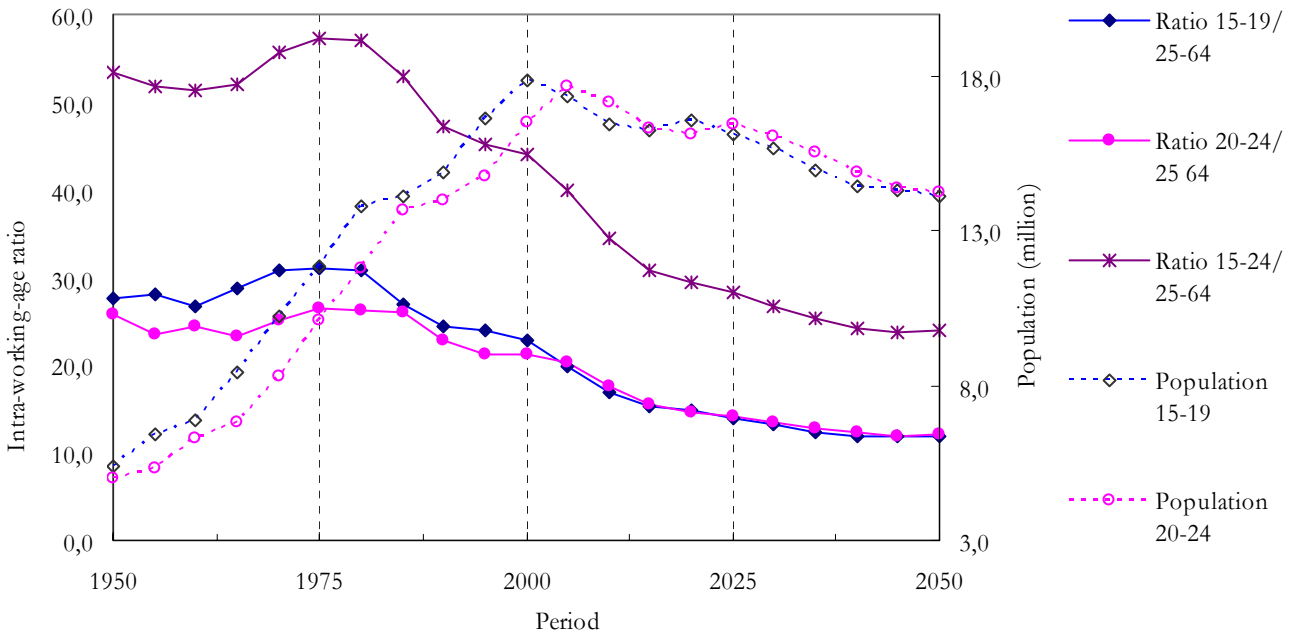
10. Between 2020 and 2040, for instance, the population size at this age will gain 20 million more people, yet notwithstanding this positive contribution will correspond in size only to the population aged 60 years or more. Below that age, each population is reducing in size.

11. Muniz (2003) has found this relationship, particularly among young men (15-19) in the Brazilian metropolitan areas, where even higher growth rates for this age group are caused by internal migration. This demographic trend is probably one of the factors that made it harder to solve unemployment problem in the nineties.

Figure 6
Brazil, 1950-2050: Population aged 15-19 and 20-24
and three intra-working-age ratios (15-19/25-64; 20-24/25-64 and 15-24/25-64)




Source: Raw data from United Nations 2003.

The ratio of the *junior* to the *mature* labour force is an indicator of the pressure for the need to generate employment. In the case of Brazil, the ratio has been downwards since the mid seventies (Figure 6). After 2000, there will be an acceleration of this trend due to the negative *r* of the young population.

Although the demographic transition from a young to an older population initially can boost the prospects for economic growth due to the reduction in the young dependency ratio, the shift to larger proportions of the population at working ages can also constitute a potential threat if the right policies are not in place (Behrman *et al.* 2001). However, during that process, the growth rates of the economic active population are differentiated by age, which does happen in the Brazilian case and it might work out as another window of opportunity. This window would be located inside the labour-force age range, where a positive *r* corresponds to the age group that includes *mature* workers, who, in turn, usually achieve higher employment rates than do junior workers,[12] at least in the case of Brazil.

## 3. Some Economic Consequences of the AST in Brazil

Despite the demographic bonus brought about by ASTs in Latin America, the economy is going through hard times. Social and economic programs being implemented by the Brazilian Government face chronic levels of domestic and international debt, and most of the funding relies on the perceptions of international investors about the state of the national economy.

In spite of its relatively good economic performance during most of the second half of last century, Brazil is still a developing country and presents one of the world's worst profiles in terms of income distribution socially and geographically, as illustrated in the Map presented in Annex 1. Public social policies have to play a significant role to overcome such disparities. But most of the social policies are age-related and will need to take into account the ongoing AST. On the one hand,

12. Findings by Behrman *et al.* (2001) show that if the age structure of the population is relatively young, the growth rate of the working-age population tends to outpace the growth rate of capital accumulation. Afterwards, when the younger cohorts reaching working age are smaller, capital per worker tends to increase.

programs dedicated to children or reproductive health, for example, could be qualitatively improved because the number of beneficiaries is lessening (in relative and very often in absolute terms). On the other hand, more pressure will come from new needs. The demands, for instance, of the older population might become so unbearable that resources from other programs might need to be re-allocated to this population segment.

To evaluate the magnitude of the forthcoming changes, this paper turns to an analysis of age-related expenditures made by the government. From this perspective of the impact of ASTs some rather different inferences can be drawn.

### *3.1. About the Government Age-Related Revenues and Expenditures*

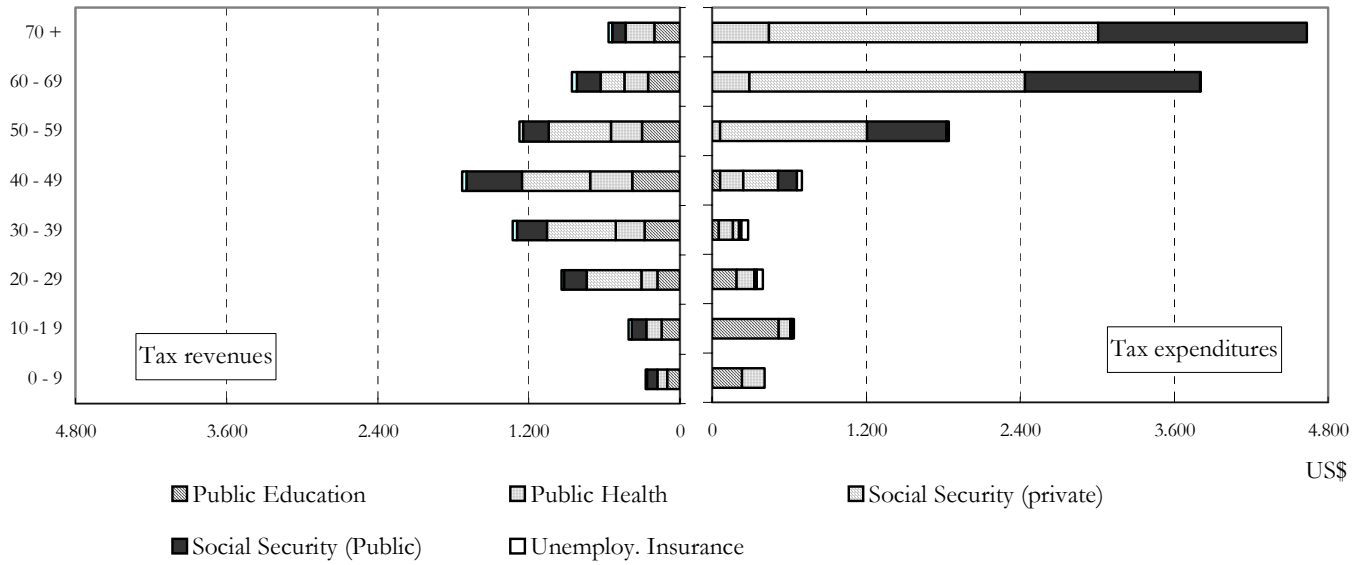
An accounting exercise of government tax transfers (revenues and expenditures) by age was made by Turra (2001) in the 1990s. This study reveals, as might be expected, that flows for funding public expenses are more important at the central ages of the economically active population. The tax age profile estimated by that author shows that transfers from the population aged 30-49 years were about US$ 2,000 per capita per annum in 1996, with ages 40-49 being the modal point (see Figure 7).[13]

Government age-related expenditures as estimated by Turra (2001) for the mid nineties were higher than age-related revenues and had different age patterns.[14] Lower volumes are assigned to young people, and most of the revenues are allocated to education, which is the case for age group 10-19. The lowest per capita expenditure goes to age group 30-39 years. After that age, government transfers increase exponentially. Transfers at older ages go almost exclusively to public health, pensions and retirement. After age 60, expenditure is higher than US$ 4,000 per annum/per capita, which is about tenfold the equivalent transferred to a child below age 10. Resources allocated to

13. These figures do not consider non-age-related items, such as public safety, transportation, research, and defence.

14. Accounting by Turra (2000) shows that total age- and non-age-related governmental tax revenues came to US$ 218 billion, equivalent to 28% of the GNP for 1996. Figures presented here do not consider non-age-related items, such as public safety, transportation, research, and defence

Figure 7
Government transfers by age groups – Annual values per capita circa 1995 (US$)




Source: Elaborated from data by Turra (2001).

the elderly Brazilian population are relatively high, and according to Turra (2001) the proportions are similar to those found in developed countries. Most of the resources go to social security due to a quite generous policy for retirees in general, and for civil service retirees in particular. A relatively small fraction goes to public health. Brazil certainly differs significantly from the majority of developed countries in this aspect.

Given the age structure of the per capita government transfers, there has been according to Turra significant economic gain due to demographic bonuses (the relatively high growth rate of the labour force being one of them). However, the demographic windows of opportunity will not last forever while there are emerging challenges that affect social phenomena that are intrinsically embedded in the new demographic patterns.

### *3.2. Projection of Age-Related Government Revenues and Expenditures*

The future government transfers (expenditures) will probably increase proportionally more than the revenues (from the taxpayers) due to the progress of the AST. A simple simulation of the transfers was made using data produced by Turra (2001). Global results are in Table 3 and figures disaggregated by age groups were plotted in Figure 8.

The exercise is done for the years 2000, 2025 and 2050 under the assumption that per capita transfers (revenues and expenditures) remain constant by age. In a broad sense, this implies constant individual tax transfers to the government and constant values for the per capita supply of basic public services such as health, education and social insurance. It would be possible to use more complex hypothesis for forecasting public revenues and expenditures that are age-related. However, the constant per capita value is assumed here, because the emphasis is on the consequences of changing age patterns over the government fiscal equilibrium.

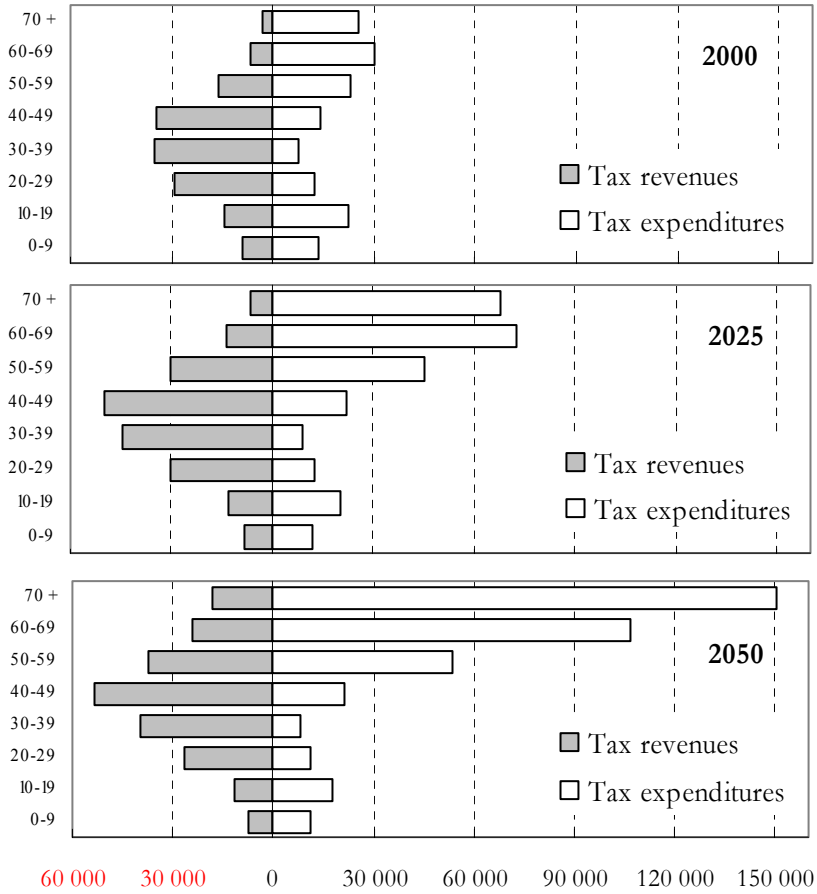
Table 3 shows that the ratio between age-related tax revenues and age-related tax expenditures (TR/TE) was near to 1.0 in 2000. Expenditures, in absolute values, were allocated primarily to groups aged 50 or more, with extreme concentration among those aged 60 or more, the pattern for TE have no resemblance to the distribution of age-related tax revenues. Among the youngsters, a higher level of expendi-

Table 3
Brazil, 2000-2050: Simulation of government age-related revenues and age-related expenditures (million US$)

| | 2000 | | 2025 | | 2050 | |
|---|---|---|---|---|---|---|
| | Age-related revenues | Age-related expenditures | Age-related revenues | Age-related expenditures | Age-related revenues | Age-related expenditures |
| Total | 148,074.0 | 148,554.5 | 196,864.5 | 235,393.6 | 217,412.3 | 380,648.0 |
| % of age-related expenditures allocated to pop. 60 + | 37.47 | | 49.35 | | 67.55 | |
| Ratio of tax revenue to tax expenditure (TR/TE) | 0.99 | | 0.84 | | 0.57 | |
| | 2000-2025 | | 2025-2050 | | 2000-2050 | |
| | Tax revenue | Tax expenditure | Tax revenue | Tax expenditure | Tax revenue | Tax expenditure |
| Relative variation<br>Annual increment | 32.9%<br>1.14% | 58.5%<br>1.84% | 10.44%<br>0.40% | 61.71%<br>1.92% | 46.8%<br>0.77% | 156.2%<br>1.88% |

Source: Estimated from data produced by Turra (2001).

Figure 8
Brazil, 2000-2050: Government tax revenues and tax expenditure by age
(million US$)




Source: Estimated from data produced by Turra (2001).

ture was allocated to the age group 10-19 than to the 0-9 years old (see Figure 8).

The 2025 scenario, however, is quite different. The TR/TE ratio (0.84) would be smaller than in the 2000 scenario (0.99). While between 2000 and 2025 age-related tax revenue would increase by 33%, because of the high growth rate of the working-age population, as said before, tax expenditures would increase even more (by nearly 60%), because of the higher proportional growth of the older population. As

a consequence, the age pattern of the government expenditures would vary drastically. Those aged 60 or more would receive half of the government funding expenses. This is expected because of the advanced ageing process (larger populations at older ages surviving for longer durations). The revenue age pattern would, however, remain fairly constant with the main contributors being the population aged 30 to 49.

The 2050 scenario follows the trend initiated around 2025 according to this simulation. The TR/TE would have dropped nearly to 0.5. Between 2025 and 2050 tax revenues would increase only slightly (10%), since the working age population (the main taxpayers) would experience small growth rates. The opposite would happen to the government age-related expenses which would grow by more than 60%, because of the rapid increase in the older population. Clearly, this would affect the public debt. Finally, while age patterns of tax revenues would remain about the same, the age pattern of public funding would exacerbate the trend described for the previous period. In absolute terms, fewer government financial resources would be allocated to the young people since it can be expected that this population will continue to have negative growth rates until the end of the first half of the century. Nearly 70% of the age-related tax expenditure would be allocated to the population aged 60 years or more.

In short, if current per capita government expenses and revenues by age are kept constant the difference between age-related government expenditures and revenues would experience a considerable expansion and cause an unbearable increment in the fiscal deficit.

## 4. Age-Related Social and Economic Policies

The AST creates different opportunities and challenges across age groups. This section considers the consequences of the age transition on the social demands of selected groups; also alternatives to sustainable development are discussed.

### *4.1. Childhood Population*

The infant population, although presenting small oscillations that cause variations in the new cohorts' sizes has, basically, below zero growth rate. Thus childhood public policies would benefit much more

the new generations, which is a demographically favourable condition on the demand side. Complementarily, the current young population has a greater chance to receive better assistance at the family level for things such as health care and food, at least in view of their lower share *vis-à-vis* the adult population that supports them. Three aspects are considered here: nutrition, education and health care.

### 4.1.1. Children's Nutrition

Conditions for improvements in nutritional standards come about during an AST. For instance, the decline of fertility in Brazil had as a consequence not only smaller family sizes but also wider birth intervals. These are typical of fertility decline consequences, and were present in Brazil (BEMFAM 1997), and thus the chance to improve levels of infant nutrition increased. The evidence confirms that these conditions improved during the eighties, when a fertility decline was well established (Peliano *et al.* 1990). However, a society can only take advantage of a demographic bonus to allow it to solve or reduce social problems if the right planning is done at the right place and at the right time. Thus, there are still vulnerable populations at these ages. Silva *et al.* (2001) have found a high prevalence of anaemia among children below 36 months of age in public day-care centres in Porto Alegre (Brazil), a city with relatively high living standards for the late nineties. Although there are no data for assessing nutritional status before the fertility decline, the finding indicates that intervention to overcome this problem is needed. Surely, this will be easier (or less difficult) with smaller cohorts.

Together with the demographic transition may come other factors that outpace the bonus. Modernization, for example, very often encourages Western nutritional habits. Brazil is now in a nutrition transitional stage experiencing increases in the prevalence of obesity and related chronic diseases: there are evidences of increasing preference for processed and junk foods regardless of socioeconomic level for a variety of Brazilian population from big cities either in the North or Southeast Brazilian regions.[15] Doyle and Feldman (1997) point to the need to involve adolescents and parents in nutrition education cam-

15. See for instance: Doyle and Feldman 1997; Aquino and Philippi 2002; Barreto and Cyrillo 2001.

paigns to improve dietary preferences and avoid the risk of chronic diseases. It is a quite obvious recommendation, but is far from being generally implemented. Another example is that, due to the Brazilian age pattern of fertility decline, there is a larger share of teenager pregnancies, and it is known that they are prone to deliver low birth weight babies. Sociocultural factors such as poverty and social deprivation, as well as biological and nutritional factors during pregnancy may be important determinants of this (Gama *et al.* (2001). Low-cost programs toward a young population that has around zero growth rates may be planned for successful interventions.

4.1.2. The School-Age Population

The population below age 15 years, in general, will probably decline in size at least until 2050, although the various age subgroups implicated will experience oscillating growth rates. Obviously, as was the case for South and Southeast Asian countries, the declines provide a clear demographic opportunity to achieve universal primary education with quality. To reach this objective a new educational model is needed with sufficient flexibility to allow planners to anticipate the oscillating population flows that will have to be attended.

The Brazilian Government has an unusual and favourable opportunity to implement an educational policy to overcome shortcomings in the elementary school system, such as unsatisfactory coverage, very high grade repeat and dropout rates, as well as the low wages and poor qualifications of teachers. The first basic goal of eliminating illiteracy is underway: the proportions illiterate among the population aged 10-14 halved during the nineties and is now around 4% according the 2000 census. Coverage also increased: school assistance for those aged 10-14 years reached 95% and for the young people aged between 15 and 19 years, the proportion reached 66% (Silva Leme and Wajnman 2000).

The infrastructure for improving the coverage of primary education is available, although it faces misallocation of both human resources and physical premises. New arrangements are needed, on the one hand, in rural areas, where the onset of fertility decline came later, but it is there where – in addition to out-migration – the number of school-age children is declining less drastically. On the other hand, reorganization is also needed because of the upsurge of new migration flows from big metropolises towards small- and medium-size cities. It is

known that the educational infrastructure usually concentrates in the big urban agglomerates to such an extent that supply may exceed demand.[16]

As the pressure for young children entering school lessens, or even disappears, those already enrolled benefit from the AST. Riani (2001) shows that decreases in the school-age cohort in the 1990s made possible increases in both coverage and quality as well as improvements in the efficiency of the educational system. As a consequence, the annual failure rates in the primary school, which are extremely high – particularly among the poor, a phenomenon that leads to high dropout rates –, might, instead, be reduced. In this way, more financial resources will be spared and could go to elementary school itself and high school, the coverage of which, as seen before, is lower than that of elementary school.

Regarding financial support, section 3.2 showed, on the one hand, that if current per capita age-related expenditures are kept constant this might result in fewer resources being allocated to education in the near future, due to the decline of school-age population in relative and even in absolute terms. On the other hand, a forecast rapidly growing fiscal deficit caused by the difference between age-related government expenditures and revenues will provide a strong argument for not raising public expenditure in the educational system. However, Brazil's current AST represents an opportunity to overcome one of its major problems, a reason why a case should be made for expansion of education instead of reducing it due to decreasing demand. The demographic bonus will only result in a large supply of human capital if appropriate investments are made (Birdsall and Sinding 1998). A further problem in spite of advancements in coverage of Brazilian basic education is an enormous deficit in terms of the secondary and university education, let alone their quality.

In addition, Brazilian economy could perform better if policies of technical training were further reinforced. According to Bowman (1987), where there is already at least some diversity in economic activity and organization – as is the Brazilian case – there is more room for progress in alternative schooling. It was not fortuitous but intended

16. It is not unusual among misinformed local politicians and community leaders to ascribe decreases in enrolment or the occurrence of under-used school capacity to a lack of planning or the absence of federal government support, instead of crediting it to reductions in the size of the school-age population.

that educational agreements involving the government and the industrial and technological sector were developed in countries that are now on the forefront of the economic challenges – such as South Korea, China and Malaysia, for instance. Thus, continuous learning through the post-school years, but not necessarily at the University, must be of increasing importance as the 21st century enters. Brazil should mirror the East Asian countries' transition, where the young population, with high skills attained through technical education, contributed to the progress in those countries (Bowman, 1987: 88-89). The quality and levels of schooling attained were such that a succession of smaller cohorts of youth did not pose problems for the quality of future labour forces.

Finally considering human resources for education, it is worth reminding oneself of what Potter (1990) calls "perverse consequences" on the educational levels of rapid fertility declines in developed countries. The United States is a good example: Preston (1984) argues that the fast fertility changes experienced by that country contributed to deterioration in children's welfare. Worse education results were attributed to downwards demand for teachers because of the declining school-age population.

> "This shift led to lower wages for teachers, which induced a disproportionate number of the better teachers to leave the field or to avoid it altogether" (Preston 1984: 449).

If quantitative demand of human resources for education is stable, there is no doubt that quality should be addressed.

One word about preschool: while social demands for this age group could in principle be better addressed given the current reduction in population size, simultaneously to the window of opportunity, Brazil undergoes its own development and modernization process that may offset the shrinkage of the new generations. A typical example is the demand for nurseries or day-care centres that may disproportionately increase due to increases in female labour-force participation – either as a cause or a consequence of the fertility decline – and the widespread of modern attitudes stimulating children to interact in places other than their private homes (Rosenberg 1995). Since those demands will have to be satisfied at any rate, huge investments to obtain skilled staff are needed; otherwise younger generations may be deprived of minimum social conditions for their welfare.

4.1.3. Health-Care Services for the Children

There has been, in general, less pressure from the demand side and more opportunities for improvement in maternal care since current cohorts are smaller.[17] Registered births attended by skilled health personnel were around 80% in the nineties whereas the figure available for 2002 is around 95% (FIBGE).

The AST has contributed to eradicating infant preventable diseases. As the fertility decline has evolved, total coverage of preventive care for some important infectious diseases due to low-cost vaccination has been reached (DATASUS 2002). Measles and hepatitis-B did not reach 100% coverage in the public vaccination campaigns, only because these services are provided also by the private sector in wealthier areas.

Child-oriented prevention programmes are expected to undergo a further growth following modernization and diffusion. In that sense, diffusing education through mass media will expand demands for preventing illnesses instead of curing them. Consequently it will be necessary to re-address and improve skills relating to health prevention. Physical activity, drug consumption and sexual behaviour, together with nutrition, previously mentioned are important examples of issues to be addressed in view of the new demographic pattern.

### *4.2. The Working-Age Population*

The Brazilian AST at working ages involves, as said, a positive *r* for the most part of the 2000-2050 period and an important and increasing share of the total population, but reaches its peak by 2025 (around 69%). Thus the first and most obvious challenge is the generation of new employment to catch up with the growth of the working-age population. Inside this large age group, however, the *junior* segment, i.e., population aged 15-24, is already entering a period of negative growth, while the *mature* labour force is increasing. From a demographic point of view, this composition represents a bonus if the labour force is productively employed. The positive growth of the *mature* labour force would lead to higher savings, higher government tax

17. The annual number of registered births dropped from 4.2 million to 3.8 between the biennia 1999-2000 and 2001-2002 respectively (FIBGE).

revenues and consequently higher capacity for funding social programs. During an AST in countries where the labour force is still an important component of the productive system, it is the working-age population which plays the most important role. On a priority basis, they should be given every opportunity to become skilled.

In Brazil, an important part of the young working-age population is still at school but some are also in employment. At ages 15-19, two thirds attend school with or without job; only one third, very often the poorest, are full-time workers. Silva Leme and Wajnman (2000) found out that among those simultaneously employed and attending school a significant portion will have re-entered school after becoming economically active. This may be the signal for pressure for further training to attain better productivity. Thus, again, policymakers could take advantage of the AST and focus on human resources in general, and on the younger generation in particular.

There are additional reasons to focus on *junior* working-age population. On the one hand, the intra-working-age ratio, that indicates less pressure on the economy for the generation of new jobs in the near future, can be interpreted as an indicator of another window of opportunity. On the other hand, this situation might also pose a threat. Chesnais (2004) has argued that this group is also a proxy for new consumption demands as they are at the stage of family formation when demands on new households rise as do purchases of furniture, cars, and similar goods. At the same time, the negative growth rate of this group might negatively affect the economy if their consumption demands are not increasing.

A factor related to the mature working-age population, specifically those aged 50 or more years, is usually the fact that their increasing share in the total population is associated with economic growth because of their high rates of saving (Lindh and Malmberg 1999); as mentioned before, their $r$ would be high and almost constant over the next few decades.

As in the case of Singapore analyzed by Navaneetham (2001), Brazil can use this demographic bonus of larger population size at age group 50-64 during the period 2005-2045 to increase saving rates and exploit this opportunity for economic growth. In this particular case, it must be said, the demographic bonus is a mere accessory. Benefits will only materialize if policies encouraging savings are implemented and, on top of this, full employment is achieved and equilibrated national

budgets are established. This is clearly a huge challenge for the Brazilian policymakers. Behrman *et al.* (2001) explain that in Latin America the ageing process did not match increases in savings in contrast with what happened in Asian countries undergoing similar AST. One reason for this, they said, is that "right when the region was provided with the demographic boost, it was hit by the negative shock of the debt crisis".

Obviously, as the elderly dependency ratio is increasing sharply, echoing what Navaneetham has reported, it is important to take advantage of the demographic bonus provided by the working-age composition, to be seen from now till at least 2045. This could increase saving rates to meet future old-age burdens.

### *4.3. The Elderly Population*

The size and share of the age group 65 or more, it has been said, will continually increase throughout the AST. Thus the Brazilian population aged 60 years or more will pass from 8.9 million in 2000 to 50 million in 2050. By then, their share would represent 20% of the total population, a proportion higher than current percentages in any European country.[18] Thus, by 2050, Brazil will probably be faced with the complex situation of catering for an aged society, older than that of today's Europe, where a much slower ageing process with concomitant social and economic development has not produced a society for all ages. The challenge in Brazil and Latin America is to know whether in a shorter period the Region – that has a noticeably unfair distribution of both incomes and social services – will be able to meet this challenge. In the absence of permanent and coherent public policies embedded in sound social and economic planning, there is the threat of increasing inequality. In formulating policies to meet this challenge, the AST should not only be taken into account but should play a fundamental role. Behrman *et al.* (2001) show, particularly for Latin America, that, when the population weight of older (and more unequal) age groups increases, inequalities tend to rise.

The challenge placed by the AST to the elderly population is to provide resources and social infrastructure to allow them an active ageing, which in terms of policy programmes should have three foun-

18. The highest proportion for the population aged 65 or more in Europe is to Italy (18.1%) for the quinquennium 2000-2005 (United Nations 2003).

dations: social security, health and participation (PAHO 2002a). Simulations predicting government expenditures make it clear that, without structural changes, there will be a serious risk of not satisfying demands implicit in implementing programs of active ageing. The changes will not be reached solely through the market forces. We turn now to comments about the three foundations necessary to secure an active ageing.

4.3.1. Social Security

Social security in Brazil, as in most Latin American countries, is a pay-as-you-go system that worked out relatively well for a relatively young, quasi-stable population, but that now has to face chronic, structural non-demographic crises. Increases in longevity occurring simultaneously with an AST will aggravate financial disequilibria in the Brazilian system if the age at retirement does not change. As is shown in the simulation noted above, transfers towards older populations will consume half of the total age-related government revenues by 2025, or about two thirds by 2050; this, of course, is on the further assumption that resources are available. The complex Brazilian social security system is one of the few where a minimum age for retirement is not universally imposed. According to more recent changes, most of the workers in the private sector are entitled to retire after 30 years (women) or 35 years (men) of contribution to social security, regardless of their age. On the other hand, after at least 78 monthly continuous contributions, one can apply for retirement at the age of 60 (women) or 65 (men).

One structural alternative to ameliorate the coming scenario is the raising of the average age for retirement.[19] Recent reforms introduced into the Brazilian Social Security System have changed the legislation relating to civil servants, requiring from new entrants a minimum age for retirement of 55 (women) and 60 (men). The rising deficits of the system will probably force the introduction of similar age constraints for workers of the private sector. Strategies like holding pension benefits constant in real terms, rather than linking them to real wage variations or reducing benefits in response to increased longevity, may be adopted. This is very often a recommendation of international creditor

19. The OECD has published several studies recommending this alternative in developed countries: see, for example, OECD 1998. See also Heller 2003.

agencies; it may easy the pension burden, although living conditions will probably deteriorate.

Incentives for staying longer in the labour force may ease the fiscal burden. Continuing to work can imply individual costs in terms of contributions paid and foregone pensions or other benefits, while it may result in permanently higher pensions after retirement; this alternative has been included in the recent proposal of changes of the Brazilian Social Security legislation. In contrast, the discouragement of early retirement would raise the labour supply of older workers, and it might be difficult to absorb this increase if there are high levels of structural unemployment, including among mature members of the labour force (see earlier), which, again, may well be the Brazilian case. Thus, again, it seems that an increase in the employment growth rate is the way to capitalize on the demographic bonus coming from the AST.

Besides, entry to the labour market after retirement is already a fact in Brazil since about one third of retirees are economically active (Liberato 2003). This happens, in part, due to the rather early age at retirement (56.5 years on average; Fígoli 2000); but mainly because despite the "generous social-security program", benefits are unequally distributed[20] and most of them return to the labour force for economic reasons. According to Schwarzer and Querino (2002), 43% of older people in the labour force are classified as "poor". Furthermore, in important urban agglomerations like Sao Paulo, nearly 80% of retirees or pensioners that re-enter the labour force report economic needs as the main reason for doing so. This is a common finding also for other Latin American cities (SABE Survey: PAHO 2002b).

### 4.3.2. Health-Care Assistance to the Older Population

It is known that the health-care needs of older populations are quite different from those of the rest of the society because of the high incidence of chronic and degenerative diseases and disability that require huge expenses in equipment, medicine, and skilled human resources. Given weaknesses in the public-health system in Brazil, the rapid ageing process points out the need to redefine this sector's policy

20. Nearly 70% of retirees receive a monthly allowance below the minimum wage (around US$ 90 for the period 2000-2003) (*Social Security Yearbook. Historic Data Base* – See: http://creme.dataprev.gov.br/infologo/inicio.htm.

in order to prevent, or at least attenuate, destitution among the older generations who, in their active lifetime, have contributed to the nation building.

An example of the magnitude of increasing costs in health care due to the ageing of the population is given by the number of older people with chronic conditions, i.e., those in permanent need of health care. It is estimated that about 75-80% of the urban population aged 60 or more in Latin America have at least one chronic condition (SABE Survey: PAHO 2002b). A conservative estimate for Brazil, applying this proportion, gives a current figure of 11 million persons aged 60 or more having at least one chronic condition. This would rise to 27 million in 2025 and to nearly 50 million by 2050. A similar extrapolation exercise considering disability, i.e., those in need of support, results in at least 2.7 million older people nowadays with one limitation in terms of daily life activities (6.7 in 2025 and 12 million in 2050).

How, then, to deal with the challenges in face of the obvious threat of insufficient economic resources? Besides the obvious need to allocate resources for the health care of elderly people, some of the possibilities lie in the implementation of specific health-care programs, some others in the social networks of elderly people.

In relation to public health, it is known that, in general, health-care services are oriented to child, maternal and reproductive matters and to dealing with infectious diseases. As the epidemiologic transition has progressed in Brazil, that approach is changing now for the country needs to be reassured that emergent health-care needs will be met. As in the case of children, public health needs to address prevention policies, focussing, for instance, on chronic diseases that very often, typically when access to medical treatment is difficult, lead to disability. The goal, according to PAHO (2002a), should be to provide adequate training for health-care workers, appropriate and necessary health care for older persons and primary health care oriented to elderly people.

#### 4.3.3. Participation - Social Networks and Intergenerational Support

The increase of longevity and therefore an increasing prevalence of disabilities in population that is becoming "older" quickly, together with deficiencies in the health-care system, mean that the best alternatives for support are the social networks available to elderly people. There is wide evidence that a strong social network will contribute to

the better welfare of elderly people.[21] In the city of Sao Paulo, the SABE Survey shows that 60% of elderly people with at least one disability receive support from close relatives (partner, child or in-law), who comprise the "informal" networks that can give support. The same survey documents Sao Paulo as being among the cities with higher levels of interaction between older adults and the community (Peláez and Wong 2004). There are also indications that intergenerational support works in the opposite direction: the family, very often, takes advantage of the elderly's retirement or pension payments, particularly in the rural area. Camarano (2002) finds out that pensions and retirement payments explain the association between the elderly contribution to the household budgets and living arrangements. This is a mechanism by which to promote integration of the family which may – or may not – favour the overall living conditions of elderly persons.

In short, encouraging the development of social networks is one way of facilitating both health care and opportunities for better conditions of living among elderly people. Policymakers take into account this low-cost resource, and stimulate and support their formation. The networks should include above all family and close relatives who will probably become the care-givers of potential disabled elderly persons.

## 5. Some Concluding Remarks

The demographic change that causes the current age-structural transition in Brazil is just an example of an almost generalized process underway in Latin America. Windows of opportunity have provided favourable conditions for the society to re-formulate social policies regarding, for example, education and the health of the children. Of course, it would be naïve to believe that a decrease in the number of births, whether in relative or even absolute terms, and a reduction in the total population growth rate as a consequence of fertility declines will result in the automatic solution of social problems (Carvalho and Wong 1998). It will require Brazilian society to take advantage of the various opportunities brought about by the fertility transition. Favourable conditions raised by the new population dynamics should be ef-

21. Cohen (2001) makes an inventory of international studies related to networks.

fectively taken into account in the implementation of social policies. A definition of priorities, based on the new demographic patterns in which the allocation of resources in sectors guaranteeing higher social yields in the medium and long term, is an urgent need. The bonus is only available on the demographic side of the population and development equation, and much of it may already have been wasted because appropriate policies were not in place.

Another opportunity brought about by the AST will unfold during the first two decades of this century: it is the positive growth rate of the working-age population, and above all, of the *mature* working-age groups while there are negative growth rates for the *junior* working population entering. Several advantages of this situation have been pointed out. This bonus, however, can only be exploited if full employment and higher productivity are pursued. Otherwise, it will instead result in a potential threat to economic and social stability.

As a necessary although not sufficient condition by which to achieve social, economic and intergenerational balances, labour-force skills should be enhanced. For this reason, opportunities to become skilled should be made a priority for workers-to-be. This would be a most effective way in which to better social conditions. Society should be always conscious that today's workers will be the ones who will have to support the rapidly growing old population in the future.

Prospectively, any exercise simulating government expenditure in the future will produce what are already well-known scenarios: older age groups will demand massive resources over the medium and long term, either because of weaknesses in the social security system, or because it is at older ages that health care becomes more necessary and more costly. The forecast fiscal crises due to the ageing of the population, combined with the unsoundness of the Brazilian Social-Security System, is a matter of daily discussion, mainly through the media, not only among government authorities, but also among other well-informed sector-groups, such as trade unionists, entrepreneurs and academics. Structural changes have been proposed and some degree of relief is expected, in spite of the strong opposition of some sectors and groups that try to maintain interests and privileges guaranteed by the present system.

Most of the policy recommendations discussed here regarding the factors impacted on by ASTs are similar to those made to developed countries decades ago. Their experiences, therefore, should be consid-

ered, taking into account, above all, the striking difference in the speed of the changes in the developing countries.[22] In order to take advantage of demographic bonuses and to prepare the society for the emerging challenges, it is extremely important to be aware of the short period to implement and accomplish plans and policies, whatever they may be. The window of opportunity has an extremely short duration, yet, it will be meaningless if reforms in policies for elder people do not succeed and, of equal importance, if funding programs directed to younger population are neglected.

Finally, to take advantage of any demographic bonus, the whole society needs to be involved. In this era of globalization, clearly, the *whole society* is not limited to national frontiers. Full employment, decent social welfare and adequate technological health-care resources cannot be achieved by any one country alone. Both the North and South hemispheres are "*the society*" and both are exposed to the (positive and negative) consequences of the Age-Structural Transitions.

**References**

AQUINO, R C and PHILIPPI, S T (2002) "Consumo infantil de alimentos industrializados e renda familiar na cidade de São Paulo", *Rev. Saúde Pública*, 36(6): 655-660.

BARRETO, S A J and CYRILLO, D C (2001) "Análise da composição dos gastos com alimentação no Município de São Paulo (Brasil) na década de 1990", *Rev. Saúde Pública,* 35(1): 52-59.

BEHRMAN J R, DURYEA, S and SZÉKELY, M (2001) "Aging and Economic Opportunities: Major World Regions around the Turn of the Century", *Proceedings of the IUSSP General Conference, Salvador, Brazil.*

BEMFAM (Sociedade Civil Bem-Estar Familiar No Brasil ) and MACRO INTERNATIONAL (1997) *Brasil, Pesquisa Sobre Saúde Familiar no Nordeste Brasil – 1997*, Rio de Janeiro.

BOWMAN, M J (1987) "Education, Population Trends, and Technological Change"; in Espenshade and Stolnitz (eds), *Technological Prospects and Population Trends*, AAAS (American Association for the Advancement of Science) Selected Symposium 103, Washington, DC.

BIRDSALL, N and SINDING, S (1998) *Report on Symposium on Population and Economic Development, November 2-6, Bellagio, Italy* (cited by Navaneetham, 2001).

CAMARANO, A A (2002) "Brazilian Population Aging: Differences in Well-Being by Rural and Urban Areas", Texto para discussão n. 878, IPEA, Rio de Janeiro.

22. See, for instance, Ogawa *et al.* 1983.

CAMARGO, A B and FRIAS, L A de M (2001) "Some Aspects of the Brazilian Mortality: The XXth Century and Perspectives - Brazilian Demography", *IUSSP General Conference, Salvador, Brazil.*

CARVALHO, J A M de and WONG, L R (1998) "Demographic and Socioeconomic Implications of Rapid Fertility Decline in Brazil: A Window of Opportunity", in Martine G, Das Gupta M, and Chen L (eds), *Reproductive Change in India and Brazil*, Oxford University Press, 208-240.

CHESNAIS, J-C (2004) Communication at the CICRED Seminar on "Age-Structural Transitions: Demographic Bonuses, but Emerging Challenges for Population and Sustainable Development", Paris, February 23-26, 2004.

COHEN, S (2001) "Social Relationships and Health: Berkman and Syme (1979)", *Advances in Mind-Body Medicine*, 17: 5-7.

DATASUS (2002), Ministério da Saúde. Informações de Saúde: http://tabnet.datasus.gov.br (01/07/2004).

DOYLE, E I and FELDMAN, R H L (1997) "Preferências nutricionais entre adolescentes da classe média de Manaus, AM (Brazil)", *Rev. Saúde Pública*, 31(4): 342-350.

FIBGE (Instituto Brasileiro de Geografia e Estatística), http://www.ibge.gov.br/brasil_em_sintese/default.htm (01/07/2004)

FÍGOLI, M G B (2000) "Envelhecimento populacional e comportamento das aposentadorias urbanas no Brasil", in Wong, L (coord), *O Envelhecimento da população brasileira e o aumento da longevidade. Subsídios para políticas orientadas ao bem-estar do idoso*, CEDEPLAR/UFMG/ABEP, 127-164.

FÍGOLI, M G B and WONG, L R (2003) "El camino hacia la estabilización demográfica y el proceso de envejecimiento en América Latina: una ilustración a partir de algunos países seleccionados", *Papeles de Población*, Nueva Época 9(35): 29-44.

GAMA, S G N, SZWARCWALD, C L, LEAL, M C *et al.* (2001) "Gravidez na adolescência como fator de risco para baixo peso ao nascer no Município do Rio de Janeiro, 1996 a 1998", *Rev. Saúde Pública*, 35(1): 74-80.

HELLER, P S (2003) *Who Will Pay? Coping with Aging Societies, Climate Change, and Other Long-Term Fiscal Challenges*, International Monetary Fund.

LIBERATO, V C (2003) *A oferta de trabalho masculina "pós-aposentadoria" Brasil Urbano - 1981/2001*, MSci. dissertation, Cedeplar/UFMG, Belo Horizonte.

LINDH, T and MALMBERG, B (1999) "Age Structure Effects and Growth in the OECD, 1950-1990", *Journal of Population Economics*, 12(3): 431-450.

MOREIRA DE M, M (1997) *Envelhecimento da população brasileira*, Ph.D. thesis, Cedeplar/UFMG, Belo Horizonte.

MUNIZ, O J (2003) *As descontinuidades demográficas exercem efeito sobre o mercado de trabalho metropolitano dos jovens?*, MSci. dissertation, Cedeplar/UFMG, Belo Horizonte.

NAVANEETHAM, K (2001) "Age Structural Transition and Economic Growth: Evidence From South and Southeast Asia", *Proceedings of the IUSSP General Conference, Salvador, Brazil.*

OECD (1998) "The Retirement Decision", *OECD Economic Outlook*, June, 1998: http://www.findarticles.com/cf_dls/m4456/n63/20792419/print.jhtml (12 Jan. 2004).

OGAWA, N, SADAHIRO, A, KONDO, M *et al.* (1983) "Demographic-Economic Model Building for Japan", in United Nations/ESCAP, *Modelling Economic and Demographic Development*, Asian Population Studies, No. 54: 117-223.

PAHO (Pan American Health Organization) (2002a) *Envejecimiento Activo: Un Cambio de Paradigma*, Washington.

PAHO (Pan American Health Organization) (2002b) *SABE Survey* (Salud y Bienestar de la población adulta mayor).

PAN AMERICAN HEALTH ORGANIZATION/MERCK INSTITUTE OF AGING (2004) *The State of Aging and Health in Latin America and the Caribbean*, Washington DC.

PELÁEZ, M and WONG, L (2004) *Vejez y Recursos Sociales en América Latina*, Monografías Humanitas 1 Envejecimiento, Fundación Medicina y Humanidades Médicas, Barcelona, 73-84.

PELIANO, A M *et al.* (1990) *Pesquisa Nacional de Saúde e Nutrição*, Brasília, INAN/IBGE/IPEA.

PERPÉTUO, I O H and WONG, L R (2003), "Programas y políticas nacionales que afectaron el curso de la fecundidad en el Brasil", Paper presented at the Seminar "La Fecundidad en America Latina y el Caribe: Transición o Revolución?",, CELADE, 9-11 June, 2003, Santiago, Chile.

POOL, I (2005) "Age-Structural Transitions and Policy: Towards Frameworks", in Tuljapurkar, S, Pool, I and Prachuabmoh, V (eds) *Riding the Age Waves. Vol. I: Population, Resources and Development*, IUSSP, International Studies in Population, Dordrecht, Springer: 13-40.

POTTER, J E (1990) "Social and Economic Consequences of Rapid Fertility Decline in a Period of Economic Crisis", Paper presented at the Seminar on the Fertility Transition in Latin America, IUSSP/CELADE/CENEP, Buenos Aires, 2-5 April, 1990.

PRESTON, S H (1984) "Children and the Elderly: Divergent Paths for America's Dependents", *Demography*, 21(4): 435-457.

PRESTON, S H, HEUVELINE, P, and GUILLOT, M (2001), *Demography. Measuring and Modelling Population Processes*, Blackwell Publishers, Oxford, UK.

RIANI, J L Ruas (2001) "Impactos da estrutura etária em indicadores de educação no Brasil, 1991", *Revista Brasileira de Estudos de População*, 18(1/2): 15-33.

ROSENBERG, G F (1995) "Fecundidade, educação infantil e género", Paper presented at the Seminar "Rapid Fertility Decline in Brazil and India: Social Determinants and Consequences", Harvard Center for Population and Development Studies, Cambridge, 3-4 April, 1995.

SAWYER, O D, WONG, L R, CARVALHO, J A M de, FÍGOLI, M, ANDRADE, F C D, BARBIERI, A F, and TAVARES, C R G (1999) *Projeção populacional por sexo e grupos qüinqüenais, das unidades da Federação, Brasil, 1990-2020*, Belo Horizonte, CEDEPLAR-UFMG (PRONEX).

SCHWARZER, H and QUERINO, A C (2002) "Benefícios sociais e pobreza: Programas não contributivos da seguridade social brasileira", Texto para discussão No. 929, IPEA, Brasília.

SILVA LEME, M C and WAJNMAN, S (2000) "A alocação do tempo dos adolescentes brasileiros entre o trabalho e a escola", *Proceedings of the XII National Meeting of the Brazilian Association for Population Studies. Caxambu, 2000.*

SILVA, Loraine Storch Meyer da, GIUGLIAN, Elsa Regina Justo, and AERTS, Denise Rangel Ganzo de Castro (2001) "Prevalência e determinantes de anemia em crianças de Porto Alegre, RS, Brasil", *Rev. Saúde Pública*, 35(1): 66-73.

TULJAPURKAR, S, POOL, I, and PRACHUABMOH, V (eds) (2005) *Riding the Age Waves. Vol. I: Population, Resources and Development*, IUSSP, International Studies in Population, Dordrecht, Springer.

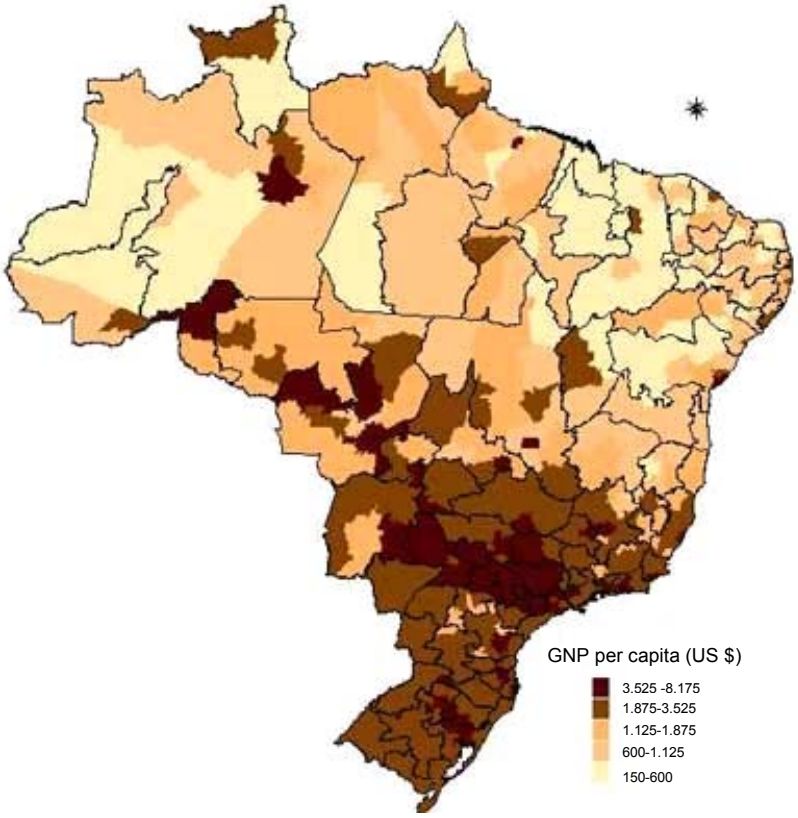
TURRA, C M (2000) *Contabilidade das gerações: Riqueza, sistemas de transferencias e conseqüências de mudanças no padrão demográfico brasileiro*, MSci. dissertation, UFMG/CEDEPLAR, Belo Horizonte, Brazil.

TURRA, C M (2001) "Intergenerational Accounting and Economic Consequences of Aging in Brazil", *Proceedings of the IUSSP General Conference, Salvador, Brazil.*

UNITED NATIONS (2003) *World Population Prospects – The 2002 Revision*, Department of Economic and Social Affairs, Population Division, New York.

WONG, L R (2000) "A projeção da fecundidade – Um exercício aplicado ao Brasil para o período 1991-2020", *Proceedings – XII*, National Meeting of the Brazilian Association for Population Studies (ABEP), 2000.

Annex 1
Brazil, 1996: Economic density according to GNP strata




Source: http://www.cedeplar.ufmg.br/pesquisas/pronex/regional.html

# 8

# TO TAKE ADVANTAGE OF THE DEMOGRAPHIC WINDOW OF OPPORTUNITY OR NOT. THAT IS THE QUESTION: THE CASE OF FIJI

**Kesaia SENILOLI**[1]

***Abstract***

Age-structural transition is a process a population undergoes as its age structure changes from a youthful one to an ageing population. Fiji has been, and is still undergoing age-structural changes. The current and future demographic scenario for the Fiji Islands raises many critical issues and challenges. Fiji faces a period of changes in its age structure with implications on everyone and all aspects of life. The challenge is that Fiji will face changing demographic condition at a lower level of economic development.

This paper attempts to study the nature and process of age-structural transition and its implications in Fiji. It also examines the age-structural changes of the two major ethnic groups. Changing age structure for Fiji presents a complex of challenges for policymakers and at the same time present potential opportunities. Many countries have benefited from the shift in balance of the broad age groups particularly the increase in working-age group, sometimes termed the demographic window of opportunity. The question of whether the "demographic bonus" or "window of opportunity" is realized in Fiji will depend on policies facilitating economic growth.

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This paper uses census data from as early as 1946 through to 1996 and uses data from population projections from 1996-2046. Fiji's working-age group increased from 1946 to 2006 for the total population where it peaked then projected to level off in the years 2016-2036. It will decline in 2046. It appears that the "demographic window of opportunity" will be between 2006 and 2036. It is a flat and long window of demographic opportunity but with a rather high level of dependency, a ratio hovering at around 60. This is linked to the relatively moderate fertility. It seems that avoiding further fertility decline will be important for sustainability in Fiji. This would not require investment in primary school education as the number of children at primary school level should stabilize but resources should be channelled to secondary and tertiary levels especially in the area of improving the quality of education. This should ensure avoidance of demographic turbulence and the path and problems faced by many developed and ageing countries.

However, age-structural change of the Fijian component of the population is different from that of Indians in Fiji. For Fijians the proportion of the working-age group started to increase in 1976 and continues to increase in the entire projected period. The demographic window of opportunity will be long but at a higher level of dependency ratio than that of the total population. The proportion of the working-age group of Indians began to increase in 1966, earlier than the Fijians. It increases up to 2036 and descends in 2046 and at a lower level of dependency. The timing of the window of opportunity is different for the two ethnic groups. It is earlier and ends earlier for the Indians and at a lower level of dependency. For the Fijians, it starts later in 1976 and continues throughout the projected period.

To take advantage of the window of opportunity Fiji has to improve economic performance and develop quality human resource. Increasing the proportion in formal employment would assist the country develop sustainably. In addition avoiding further fertility decline would also assist the country develop sustainably.

## 1. Introduction

The Pacific region covers some 30 million sq. km of Pacific Ocean and comprises 22 island countries and territories. Hauofa (1993) has described the region as "a sea of islands". Fiji is one of the Pacific Island territories. Like other Pacific Island territories its population is small by world standards. This is not to say that population issues are of little significance in the Fiji or in other Pacific Island states. Because

Fiji like other Pacific Island states has a fragile ecosystem and economy, population issues are of immense importance.

Moreover, Fiji is a plural society with ethnic Fijians comprising 48 per cent of the population, Indians 46 per cent and other ethnic groups 6 per cent. The two major ethnic groups follow different demographic patterns. It will be interesting therefore to examine how they contribute to the age-structural transition of the country and their different patterns of age-structural transition.

Age-structural transition is a process a population undergoes as its age structure changes from a youthful one to an ageing population. Fiji has been and is still undergoing age-structural changes. The current and future demographic scenario for the Fiji Islands raises many critical issues and challenges. Fiji faces a period of changes in its age structure with implications on everyone and all aspects of life. The challenge is that Fiji will face changing demographic condition at a lower level of economic development.

This paper attempts to study the nature and process of age-structural transition in Fiji, a small island nation, and its implications. It also examines the different patterns of age-structural transition of the two major ethnic groups, ethnic Fijians and Indians in the country. Changing age structure for Fiji presents a complex of challenges for policymakers and at the same time presents potential opportunities. Many countries have benefited from the shift in balance of the broad age groups particularly the increase in working-age group, sometimes termed the "demographic window of opportunity". The question of whether the "demographic window of opportunity" is realized in Fiji will depend on policies facilitating economic growth.

This paper uses census data from as early as 1946 to 1996 and uses data from population projections[2] from 1996-2046.

## 2. Demographic Transition and AST

The Demographic Transition illustrates the pattern of change in birth and death rates over a period of time as a country develops. Changes in age structure are an integral part of demographic change in vital rates.

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2. Population projections by the author using the component method and SPECTRUM.

The age-structural transition is determined to a large extent by the decline in mortality and fertility. The timing, pace and scale of fertility and mortality decline is different for different populations such as the two ethnic communities in Fiji.

The pre-transition stage is when fertility is moderately high accompanied by a fluctuating high mortality rate resulting in a constant age structure. In the pre-transition stage, however, mortality declines while fertility remains as in the previous stage resulting in a youthful population with a high dependency ratio. The population is dominated by those in the under-15-year age group. In the late transition period, fertility declines resulting in the movement across life-cycle stages of large birth cohorts born in the past. This results in the increase in the proportion in the working-age group. As a consequence the dependency ratio declines. The last stage, characteristic of many developed countries is identified by low birth and death rates. This phase is characterized by a large proportion of elderly population and therefore an increase in dependency ratio.

The changes in age structure have social and economic ramifications. Many scholars have indicated that the increase in working population is a "demographic bonus" or "window of opportunity". The question is whether Fiji will take advantage of this opportunity.

## 3. Changing Age Structure – Demographic Trends

### *3.1. The Mortality Transition*

Fiji has made very significant progress in the struggle to lower their mortality, particularly infant and child mortality. Recently mortality has started to level off and seems to occur at an Infant Mortality Rate (IMR) level of approximately 16/1000 and an average life expectancy of about 66 years. This level of mortality is low by developing country standards.

There is scope for further mortality decline in Fiji. In order to bring mortality level, particularly IMR and life expectancy, close to those of Western nations, massive effort has to be made to improve shelter, water supply, sewage system and nutrition – the general living standards of the ordinary people. A shift in focus of the health sector to preventive instead of curative services can contribute significantly to improvement in the quality of life of the people of Fiji.

Offsetting the fall in the IMR has been an increase in the prevalence of some non-communicable diseases such as diabetes and hypertension. Changes in taste and diet containing high fat content and sugar and sedentary lifestyles all contribute to the increase in prevalence of these diseases. The situation has been aggravated against a background of declining public-sector health budgets and the consequent decline in the quality of health services.

Table 1
Average life expectancy (years) at birth,
20 years, 45 years, 65 years and 80 years, 1976-1996

| Sex | 1976 | | 1996 | |
|---|---|---|---|---|
| | Fijians | Indians | Fijians | Indians |
| | *Life expectancy at birth* | | | |
| Males | 60.7 | 59.5 | 64.8 | 64.0 |
| Females | 63.9 | 62.4 | 68.1 | 69.0 |
| | *Life expectancy at 20 years* | | | |
| Males | 46.5 | 45.8 | 47.5 | 46.2 |
| Females | 48.5 | 47.6 | 50.8 | 51.0 |
| | *Life expectancy at 45 years* | | | |
| Males | 25.4 | 24.9 | 24.9 | 23.9 |
| Females | 26.7 | 26.1 | 27.8 | 32.2 |
| | *Life expectancy at 65 years* | | | |
| Males | 10.8 | 10.6 | 11.0 | 10.3 |
| Females | 11.3 | 11.1 | 12.9 | 12.6 |
| | *Life expectancy at 80 years* | | | |
| Males | 4.2 | 4.2 | 5.1 | 4.5 |
| Females | 4.2 | 4.2 | 5.6 | 5.1 |

Sources: Zwart 1979: 143-146; Fiji Bureau of Statistics 1989: 180-183; Fiji Bureau of Statistics 1998b: 30-34 and 75-76.

Mortality decline has contributed to the age-structural transition of Fiji's population. Fiji is experiencing a sustained decline in mortality resulting in increased longevity. Table 1 shows the increased longevity as seen in the gradual increase in life expectancy at birth from 1976 to

1996 for the two major ethnic groups and genders. The table also shows the life expectancy for those who reach 60 years, 65 years and 80 years. There is an increase in life expectancy at ages 65 and 80 years in 1996. In addition, the number of people over the age of 60 years increased from 16,174 in 1966 to 39,830 in 1996.

The projections assume that the Fijian population has a life expectancy of 68.1 years in 2006. This would increase to 73 years in 2026 and 78 years in 2046. The life expectancy of the Indian component of the population, on the other hand is expected to increase to 68.9 years in 2006, 73.3 years in 2026 and 77.5 years in 2046 (Table 2).

Table 2
Projection of some age-structural change indicators,
Fiji 2000-2045

| Indicator | 2001 | 2006 | 2016 | 2026 | 2046 |
|---|---|---|---|---|---|
| Percentage in older ages | | | | | |
| 20+ years | 57.1 | 60.0 | 63.3 | 65.2 | 70.0 |
| 45 years | 18.3 | 20.2 | 24.0 | 27.7 | 28.6 |
| 65 years | 3.5 | 3.9 | 5.5 | 7.6 | 11.5 |
| Median age | 20.7 | 24.9 | 27.8 | 30.1 | 33.7 |
| Dependency ratio | 60.7 | 58.4 | 59.5 | 60.7 | 65.1 |
| Broad age groups | | | | | |
| 0-14 | 31.9 | 30.5 | 28.5 | 26.2 | 22.5 |
| 15-59 | 62.2 | 63.1 | 62.7 | 62.2 | 60.6 |
| 60+ | 5.9 | 6.4 | 8.8 | 11.6 | 16.9 |
| Sex ratio per 100 women | | | | | |
| 20+ | 101 | 100 | 101 | 102 | 100 |
| 45+ | 95 | 98 | 94 | 94 | 83 |
| 65+ | 85 | 90 | 79 | 80 | 82 |
| 80+ | 73 | 85 | 70 | 65 | 66 |
| Total fertility rate | | | | | |
| Fijians | 3.18 | 3.06 | 3.82 | 2.58 | 2.1 |
| Indians | 2.14 | 2.14 | 2.14 | 2.12 | 2.1 |
| Life expectancy | | | | | |
| Fijians | 66.8 | 68.1 | 70.5 | 73.0 | 78.0 |
| Indians | 68.1 | 68.9 | 71.2 | 73.3 | 77.5 |

### *3.2. The Fertility Transition*

The main determinant of demographic change has been the decline in fertility. Fiji is experiencing new reproductive behaviours resulting in fertility transition. The rapid decline in infant mortality coupled with increase in numbers of secondary-school educated women and increased participation of women in the workforce have led to declining fertility. In addition use of contraception and the costs of child bearing and rearing have also contributed to fertility decline in Fiji.

Table 3 shows that children ever born to women aged 45-49 years declined from 1956 to 1996 for both the major ethnic groups in Fiji. It also shows the differences in pace of fertility decline for Fijians and Indians. The Fijian total fertility rate declined from 5.2 children per woman in 1956 to 3.9 children per woman in 1996 – a decline of 25 per cent; the fertility decline of Indians was more rapid: 53 per cent.

Table 3
Average number of children ever born by age of mother and TFR by ethnicity, derived from census lifetime fertility data 1956 and 1996

| Age of mother | Total population | | Fijians | | Indians | |
|---|---|---|---|---|---|---|
| | 1956 | 1996 | 1956 | 1996 | 1956 | 1996 |
| 15-19 | 0.23 | 0.08 | 0.09 | 0.08 | 0.04 | 0.08 |
| 20-24 | 1.64 | 0.75 | 1.10 | 0.70 | 2.23 | 0.83 |
| 25-29 | 3.32 | 1.79 | 2.58 | 1.76 | 4.25 | 1.86 |
| 30-34 | 4.62 | 2.60 | 3.80 | 2.71 | 5.73 | 2.51 |
| 35-39 | 5.50 | 3.15 | 4.79 | 3.40 | 6.60 | 2.94 |
| 40-44 | 5.81 | 3.57 | 5.47 | 3.88 | 6.73 | 3.29 |
| 45-49 | 6.11 | 3.88 | 5.88 | 4.19 | 6.94 | 3.64 |
| TFR | | | 5.2 | 3.9 | 5.3 | 2.5 |

Source: Fiji Bureau of Statistics 1998b: 80, 85.

However, despite the decline in fertility there are a number of processes occurring. There is evidence of momentum effects (Table 4). This is seen with the increase in the number of births from 1996 to 2036 even though there is a decline in the Total Fertility Rate. This is supported by the fact that in the projected period 1996-2046 the num-

ber of women of childbearing age continues to increase. This is the result of the movement across life-cycle stages of large birth cohorts born in the past.

Table 4
Projection of women in reproductive ages and births, Fiji 2001-2046*

| Indicator | 2001 | 2006 | 2016 | 2026 | 2036 | 2046 |
|---|---|---|---|---|---|---|
| *Fijians* | | | | | | |
| 15-49 years | 110,320 | 122,470 | 144,550 | 167,220 | 186,250 | 199,890 |
| Births | 10,140 | 11,760 | 12,990 | 13,000 | 13,150 | 12,700 |
| *Indians* | | | | | | |
| 15-49 years | 103,250 | 108,440 | 112,480 | 120,000 | 115,720 | 115,810 |
| Births | 5,970 | 7,520 | 7,340 | 6,870 | 7,240 | 7,040 |
| *Total* | | | | | | |
| 15-49 years | 225,460 | 249,670 | 271,780 | 303,930 | 326,800 | 335,590 |
| Births | 18,760 | 20,460 | 21,580 | 21,170 | 21,680 | 20,980 |

* The sum of *Fijians* and *Indians* figures does not equal the corresponding *Total*: the difference includes other minority ethnic groups (applies also to following tables).

Declining mortality and a relatively moderate fertility have yielded a low but positive population growth rate.

### *3.3. Increasing Out-Migration*

Birth cohort sizes largely determine the age structure and in some countries migration can also affect cohort sizes. Table 5 shows the net migration from 1996 to 2002.

Government is currently facing the challenge of losing people skilled and qualified and aged 15-49 years. Skilled and qualified people include architects, engineers, accountants, teachers, medical professionals. People have been attracted by higher wage rates, higher living standards, better socioeconomic opportunities and job opportunities in the Pacific Rim countries. In addition, other causes of emigration of people from Fiji include land tenure insecurity and political instability (Reddy *et al.* 2002; Chand and Naidu 1998). The political turmoils of 1987 and 2000 have increased the rate of out-migration from Fiji. In

1995 Gani and Ward indicated that political instability was the reason for emigration to New Zealand of many professional people.

Table 5
Net migration by ethnicity, 1996-2002

| Year | Fijians | | Indians | | Others | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Males | Females | Males | Females | Males | Females | Males | Females |
| 1996 | -459 | -592 | -3,111 | -3,522 | -1,066 | -681 | -4,636 | -4,795 |
| 1997 | -206 | -94 | -1,416 | -1,679 | -763 | -558 | -2,385 | -2,331 |
| 1998 | -417 | -375 | -2,209 | -2,472 | -1,220 | -881 | -3,846 | -3,728 |
| 1999 | -297 | -258 | -3,155 | -3,592 | -857 | -532 | -4,309 | -4,382 |
| 2000 | -1,239 | -929 | -3,042 | -3,296 | -2,109 | -1,951 | -6,390 | -6,176 |
| 2001 | -679 | -439 | -3,756 | -3,970 | -930 | -825 | -5,365 | -5,234 |
| 2002 | -129 | -354 | -1,706 | -1,844 | -1,111 | -781 | -2,946 | -2,979 |

In the projections used in this study the average net migration for the years 1996 to 2002 was taken as the annual net migration for projected period 2003-2046. This assumption was made given the continuing number of professionals and skilled people leaving the country and the young men leaving for British military services. Despite the government vision for the future of "A peaceful and prosperous Fiji" and government working towards resolving the land lease issue, security and law and order, political stability and attracting investments, people in the professional and technical categories continue to move out of Fiji.

When the numbers of migrants were doubled for the projected period, migration unlike the other population processes has an insignificant effect on the age structure of Fijians and Fiji Indians. The Indians continue to move out of Fiji in relatively larger numbers but the effects of this on the age structure are very small. It affects the working-age group 15-49 years.

### *3.4. Age-Structural Changes in Rural Fiji*

Internal migration unlike international migration has more impact on Fiji's subpopulation age structures. The economy is primarily agrarian with about 54 per cent of the population living in rural areas. Redis-

tribution of people from the countryside to the urban areas is one of the most significant demographic movements in Fiji (Table 6). Table 7 shows the shift out of agriculture to other sectors in the employment structure. The process will continue to be a dominant feature of the population picture for some time in future.

Table 6
Urban/Rural distribution of the population

| | 1986 | | 1996 | | Average annual growth rate (%) |
|---|---|---|---|---|---|
| | Population | % | Population | % | |
| Urban | 277,025 | 38.7 | 359,495 | 46.4 | 2.6 |
| Rural | 438,350 | 61.3 | 415,582 | 53.6 | -0.5 |
| Total | 715,375 | 100.0 | 775,077 | 100.0 | 0.8 |

Table 7
Employment by broad sector

| Economic sector | 1986 | | 1996 | |
|---|---|---|---|---|
| | No. | % | No. | % |
| Formal sector | 80,000 | 31.2 | 110,081 | 39.2 |
| Non-agriculture informal sector | 43,115 | 16.8 | 46,826 | 16.7 |
| Money-economy agriculture | 67,726 | 26.4 | 62,407 | 22.3 |
| Subsistence agriculture | 65,506 | 25.6 | 61,191 | 21.8 |
| Total | 256,347 | 100.0 | 280,505 | 100.0 |

Source: Fiji Bureau of Statistics, cited in Fiji Ministry of Finance and National Planning (2002).

Table 8 shows that the total dependency ratio declined gradually in rural areas whereas in the urban areas there was a marked decrease in the intercensal period 1986-1996. This reflects the outflow of people in the working-age group from rural areas.

The most important determinant of the age structure in rural populations is rural-urban movement, which comprises many in the working categories leaving behind large proportions of elderly and young people in the rural areas. This is well illustrated in Table 9, which shows that from 1976 to 1996, the proportion of elderly in rural

Table 8
Total population and proportional distribution by large age groups, dependency ratio and its components, and median age

| Years | Population | Relative age distribution (%) | | | Dependency ratios (%)* | | | Median age |
|---|---|---|---|---|---|---|---|---|
| | | 0-14 | 15-59 | 60+ | TDR | CDR | ADR | |
| 1986 | Urban | 36.5 | 59.6 | 3.9 | 67.7 | 61.2 | 6.5 | 21.5 |
| | Fijian | 37.3 | 58.9 | 3.8 | 69.6 | 63.2 | 6.4 | 20.7 |
| | Indian | 36.2 | 60.1 | 3.7 | 66.3 | 60.2 | 6.1 | 22.0 |
| | Rural | 39.5 | 55.4 | 5.1 | 80.6 | 71.4 | 9.2 | 20.0 |
| | Fijian | 40.3 | 53.5 | 6.2 | 87.0 | 75.5 | 11.6 | 19.9 |
| | Indian | 38.7 | 57.5 | 3.8 | 73.8 | 67.2 | 6.5 | 20.2 |
| 1996 | Urban | 32.6 | 63.0 | 4.4 | 58.8 | 51.8 | 7.0 | 21.9 |
| | Fijian | 34.8 | 61.0 | 4.2 | 64.0 | 57.2 | 6.9 | 20.7 |
| | Indian | 30.6 | 65.0 | 4.4 | 53.8 | 47.0 | 6.7 | 23.1 |
| | Rural | 37.7 | 56.5 | 5.8 | 77.1 | 66.8 | 10.2 | 20.4 |
| | Fijian | 40.0 | 53.4 | 6.6 | 87.2 | 74.9 | 12.2 | 19.4 |
| | Indian | 34.6 | 60.8 | 4.6 | 64.6 | 57.0 | 7.6 | 21.5 |

* TDR: Total Dependency Ratio; CDR: Child Dependency Ratio; ADR: Aged Dependency Ratio.

Table 9
Population aged 60 years and above (in %) by urban/rural ratio of percentages of the elderly, Fiji 1976, 1986 and 1996

| Year and ethnicity | Total population | Proportion 60 years and older (%) | | |
|---|---|---|---|---|
| | | Urban population | Rural population | Urban/Rural ratio |
| 1976 | 588,068 | 3.5 | 4.4 | 1.3 |
| Fijians | 259,932 | 3.5 | 5.9 | 1.7 |
| Indians | 292,896 | 3.0 | 2.8 | 0.9 |
| 1986 | 715,375 | 3.9 | 5.1 | 1.3 |
| Fijians | 329,305 | 3.8 | 6.2 | 1.6 |
| Indians | 348,704 | 3.7 | 3.8 | 1.0 |
| 1996 | 775,077 | 4.4 | 5.8 | 1.3 |
| Fijians | 393,575 | 4.2 | 6.6 | 1.6 |
| Indians | 338,818 | 4.4 | 4.6 | 1.5 |

Sources: Fiji Bureau of Statistics 1977: Tables 2 and 3; Fiji Bureau of Statistics 1988: Table 2; Fiji Bureau of Statistics 1998b: Table 2.

Table 10
Rural/Urban and total population by sex ratio

| Year and ethnicity | Sex ratio of people 60 years and older (per 100 women) | | |
|---|---|---|---|
| | Total population | Urban population | Rural population |
| 1976 | | | |
| Fijians | 95.4 | 84.5 | 98.4 |
| Indians | 115.6 | 109.1 | 120.3 |
| 1986 | | | |
| Fijians | 99.2 | 92.8 | 101.2 |
| Indians | 101.6 | 91.2 | 112.4 |
| 1996 | | | |
| Fijians | 92.2 | 82.9 | 95.9 |
| Indians | 87.7 | 82.8 | 92.5 |

Sources: Fiji Bureau of Statistics 1977: Tables 2 and 3; Fiji Bureau of Statistics 1988: Table 2; Fiji Bureau of Statistics 1998b: Table 2.

areas was higher than the proportion in urban areas. Table 8 shows the large proportion of young people in the rural population. The retirees returning to the villages and rural settlements assist in speeding up the increase of the elderly in rural areas. Table 10 shows the higher proportion of women in the old-age category in 1996. It is in the villages and rural settlements that the consequences of age-structural transition brought about by rural-urban movement are most likely to be felt.

The effects of changing age structures are shown in the dependency ratio (Table 8). The rural area has a large proportion of youth dependants, particularly among Fijians, and ageing as an economic burden is a rising but not a significant issue. In 1996, overall dependency in urban Fiji was lower than in rural areas.

## 4. Changing Age Structure and Economic Growth

The combination of the decline in mortality, fertility and to a very small extent migration has contributed to the disordered flows of age cohorts and consequently to the changing balance of the age groups.

Fertility decline is the main factor driving the age-structural change. In the projections it is assumed that fertility and mortality levels will continue to decline and that the average net migration for the years 1996-2002 will be constant for the projected period 1996-2046. The results of the projections are shown in Tables 11, 11.1 and 11.2.

The changing balance in the size of the broad age groups as seen in Table 11 will be discussed against the economic condition at the time. Economic measures used are the real GDP growth and per capita GDP growth (Table 12).

Table 11 shows that the share of the population under 15 years increased until 1976 after which it declined. The increase coincided with an average real GDP growth of 5.9 per cent per annum. The annual GDP growth rates fluctuated between a low of 0.1 and 12.7 per cent during this time. This was a time of high dependency ratio and high social-sector expenditures.

The decline in proportion of people 0-15 years after 1976 coincided with a decline in real GDP growth rate: 3.4 per cent annually between 1976-1980 and 2.1 per cent in 1981-1986. Between 1987 and 1996 real GDP growth averaged 2.5 per cent annually. Despite the decline in proportion of people under 15 years, it still was above 35 per cent with much of the expenditure going to social sectors such as education and health.

In 1971-1975 real per capita GDP increased by an annual average of 3.8 per cent as population increased by 1.8 per cent indicating gain in overall living standards. In the next five years population rose by 2.0 per cent while per capita GDP growth rate slowed down to 1.4 per cent. The real per capita GDP growth fell drastically to 0 in the period 1980-1986. At the same time population grew by 2.0 per cent indicating the fall in overall living standards. After the first coup d'État, 1987-1995 real per capita GDP growth rate of 1.5 exceeded population growth rate of about 1.2 per cent because of emigration by Fiji Indians. The 1990s per capita GDP growth averaged 0.9 per cent, which was less than the population growth rate (Bank of Hawaii 2000). This meant that there was no improvement in average standard of living in Fiji in the 1990s.

Economists indicate that prolonged periods of growth of about 5 per cent or more is required to bring about savings and investment to make the shift from agrarian to agro-industrial production and high value services. They also indicate that the fluctuation in production and

Table 11
Total population and proportional distribution by large age groups, dependency ratio and its components, and median age

| Years | Total population | Relative age distribution (%) | | | Dependency ratios (%) | | | Median age |
|---|---|---|---|---|---|---|---|---|
| | | 0-14 | 15-59 | 60+ | TDR | CDR | ADR | |
| 1946 | 259,638 | 44.3 | 49.0 | 6.6 | 103.9 | 90.4 | 13.5 | 17.9 |
| 1956 | 345,737 | 46.1 | 48.9 | 5.0 | 104.5 | 94.2 | 10.2 | 16.9 |
| 1966 | 476,727 | 46.7 | 50.9 | 2.4 | 96.6 | 91.9 | 4.7 | 16.5 |
| 1976 | 588,068 | 41.4 | 54.5 | 4.1 | 83.5 | 76.0 | 7.5 | 18.5 |
| 1986 | 715,375 | 38.4 | 57.0 | 4.6 | 75.4 | 67.3 | 8.1 | 20.6 |
| 1996 | 775,077 | 35.4 | 59.5 | 5.1 | 68.1 | 59.5 | 8.6 | 21.2 |
| 2006 | 914,330 | 30.5 | 63.1 | 6.4 | 58.4 | 48.3 | 10.1 | 24.9 |
| 2016 | 1,052,860 | 28.5 | 62.7 | 8.8 | 59.5 | 45.5 | 14.0 | 27.8 |
| 2026 | 1,184,780 | 26.2 | 62.2 | 11.6 | 60.7 | 42.2 | 18.6 | 30.1 |
| 2036 | 1,306,700 | 24.3 | 62.9 | 12.8 | 59.0 | 38.6 | 20.4 | 31.4 |
| 2046 | 1,408,230 | 22.5 | 60.6 | 16.9 | 65.1 | 37.1 | 27.9 | 33.7 |

Table 11.1
Fijian population and proportional distribution by large age groups, dependency ratio and its components, and median age

| Years | Fijian total population | Relative age distribution (%) | | | Dependency ratios (%) | | | Median age |
|---|---|---|---|---|---|---|---|---|
| | | 0-14 | 15-59 | 60+ | TDR | CDR | ADR | |
| 1946 | 117,488 | 41.0 | 52.5 | 6.5 | 90.5 | 78.2 | 12.3 | 19.7 |
| 1956 | 148,134 | 42.1 | 54.4 | 3.5 | 83.8 | 77.3 | 6.5 | 18.8 |
| 1966 | 202,176 | 44.4 | 52.8 | 2.8 | 89.5 | 84.1 | 5.4 | 17.8 |
| 1976 | 259,932 | 41.5 | 55.4 | 3.0 | 80.4 | 75.0 | 5.4 | 18.7 |
| 1986 | 329,305 | 39.3 | 57.2 | 3.5 | 74.8 | 68.8 | 6.1 | 20.2 |
| 1996 | 393,575 | 37.9 | 58.7 | 3.4 | 70.5 | 64.6 | 5.9 | 21.1 |
| 2006 | 473,370 | 33.6 | 62.2 | 4.2 | 60.7 | 54.0 | 6.7 | 23.2 |
| 2016 | 563,420 | 31.1 | 63.9 | 4.9 | 56.4 | 48.7 | 7.7 | 25.3 |
| 2026 | 653,480 | 28.8 | 64.9 | 6.3 | 54.1 | 44.5 | 9.7 | 27.6 |
| 2036 | 737,960 | 26.0 | 66.1 | 7.9 | 51.3 | 39.3 | 11.9 | 29.5 |
| 2046 | 813,730 | 23.6 | 66.6 | 9.8 | 50.1 | 35.5 | 14.6 | 32.0 |

Table 11.2
Indian population and proportional distribution by large age groups, dependency ratio and its components, and median age

| Years | Indian total population | Relative age distribution (%) | | | Dependency ratios (%) | | | Median age |
|---|---|---|---|---|---|---|---|---|
| | | 0-14 | 15-59 | 60+ | TDR | CDR | ADR | |
| 1946 | 120,063 | 48.7 | 47.8 | 3.5 | 109.0 | 101.8 | 7.2 | 17.9 |
| 1956 | 169,403 | 50.6 | 46.7 | 2.7 | 114.3 | 108.4 | 5.9 | 14.8 |
| 1966 | 240,960 | 49.5 | 48.7 | 1.8 | 105.2 | 101.5 | 3.7 | 15.2 |
| 1976 | 292,896 | 41.1 | 57.3 | 1.6 | 74.6 | 71.8 | 2.8 | 18.3 |
| 1986 | 348,704 | 37.7 | 60.0 | 2.3 | 66.6 | 62.7 | 3.9 | 20.9 |
| 1996 | 338,818 | 32.6 | 64.7 | 2.7 | 54.6 | 50.4 | 4.2 | 23.4 |
| 2006 | 384,370 | 26.1 | 70.0 | 4.0 | 54.6 | 43.2 | 11.4 | 27.2 |
| 2016 | 430,800 | 25.0 | 68.7 | 6.3 | 45.5 | 36.4 | 9.2 | 31.1 |
| 2026 | 464,550 | 22.4 | 68.2 | 9.4 | 46.6 | 32.8 | 13.8 | 33.9 |
| 2036 | 491,880 | 21.0 | 67.5 | 11.5 | 48.1 | 31.0 | 17.0 | 35.3 |
| 2046 | 513,420 | 20.6 | 65.0 | 14.4 | 53.7 | 31.7 | 22.1 | 36.9 |

Table 12
Evolution of GDP, Fiji, 1971-2001

| Real GDP growth, 1971-2001 | 1971-75 | 1976-80 | 1981-86 | 1987-95 | 2001 |
|---|---|---|---|---|---|
| GDP growth rate | 5.9 | 3.4 | 2.1 | 2.5 | 4.0 |
| GDP per capita growth rate | 3.8 | 1.4 | 0.0 | 1.2 | na |

Source: Bank of Hawaii, http://www.boh.com/econ/pacific/fj/fj_07-gdp.asp; ADB 2003a.

economic growth since the 1970s implies a higher degree of vulnerability to domestic and foreign economic influences. There is need for stability in the investment environment and in increasing economic diversification (Bank of Hawaii 2000).

The economy however contracted by 9.3 per cent in 2000, the effect of political instability and widespread civil disorder. In 2001 the real GDP growth was estimated at 1.0 per cent (ADB 2003b). Assuming that the political problems will not be repeated the economy is projected to grow by nearly 5 per cent in 2002 (ADB 2003b).

Some countries have illustrated that the growth of the working-age population has had a positive impact on the GDP per capita growth (UN 2003). Fiji's working-age group increased from 1946 to 2006 for the total population where it peaked then projected to level off in the years 2016-2036. It will decline in 2046. Most of people in the working-age group are urban dwellers. It appears that the "demographic window of opportunity" will be between 2006 and 2036. It is a flat and long window of demographic opportunity at a rather high level of dependency ratio hovering at around 60 per cent. This is linked to the relatively moderate fertility. It seems that avoiding further fertility decline will be important for sustainability in Fiji. This would not require more investment in primary school education as the number of children at primary school level should stabilize but resources would be required at secondary and tertiary levels especially in the area of improving the quality of education. This should ensure avoidance of the path and problems faced by many ageing developed countries.

Table 11.1 shows the age-structural change among the Fijian component of the population. The proportion of the working-age group started to increase in 1976 and continues to increase in the entire projected period. The demographic window of opportunity will be long but at a higher level of dependency ratio than that of the total population. Table 11.2 shows age-structural change of the Indian component of the population. The proportion of the working-age group began to increase in 1966, earlier than among the Fijians. It increases up to 2036 and descends in 2046 and at a lower level of dependency ratio than that of Fijians and the total population. The timing of the window of opportunity is different for the two ethnic groups. It is earlier and ends earlier for the Indians and at lower level of dependency ratio. For the Fijians, it starts later in 1976 and continues throughout the projected period.

## 5. Environment to Exploit the Demographic Bonus

The UN (2002) has indicated that about 33 per cent of economic growth of the Asian tigers in the 1980s and 1990s can be attributed to the demographic bonus. The period of demographic bonus is not permanent, making it prudent for countries to take advantage of it.

### *5.1. Economic Growth*

If the share of people below the age of 15 years declines and the working population increases then the per capita GDP is likely to increase because of the increase in people saving. A country can only take advantage of this demographic gift if it puts in place appropriate policies. This demographic bonus will be available in the next few years for a span of about 30 years only. During this time the country could benefit from more workers producing more total output, greater wealth and accumulation and an increasing supply of human capital. During this period of "demographic gift" the social-sector expenditure is reduced due to the decline in people below the age of 15 years and the decline in their demand for educational and health services. Consequently this should contribute to the growth of the economy.

From 1971 to 1995 real per capita GDP grew on average by 1.6 per cent whilst population grew by 1.7 per cent indicating that standards of living did not make any gains in the 25 years. In the 1990s real per capita GDP grew by 0.9 per cent and in 2001 its growth rate increased slightly to 1.0 per cent. Despite poor performance in the last three decades the Government is making a concerted effort to increase economic growth. Fiji's economy rebounded to register a GDP growth of 4 per cent in 2001 and 2002 and 5 per cent is forecast for 2003 (ADB 2003a). Fiji has potential for improving its economic growth.

### *5.2. Human-Resource Development*

To create the environment to take advantage of the "window of opportunity" government must invest in the school-age population to be educated and have the skills relevant for employment. In addition investment in health is also important to ensure that the working population is healthy and productive. Human-resource development is very important in preparing the large pool of people entering the working-age group each year. Government is investing much in the area of human resources to cover the loss to the country's human resources due to migration. It is investing in human-resource development of civil servants and students in tertiary institutions to support both the public and private sectors.

A healthy population is also important in order to have an effective and productive workforce. Government is already focussing on

strengthening primary and preventive health and curative health services (Fiji Ministry of Finance and National Planning 2002). Rural health is also the focus of government. This will be cheaper in the long run as it will prevent costly outlays in treating illnesses such as diabetes, cardiovascular diseases and HIV/AIDS which are expensive to treat.

### *5.3. Productive Employment*

The increase in the proportion of people in the working-age group is important in realizing the benefits of the demographic bonus. It implies more workers productively employed producing more total output essential for economic growth. Economic growth is usually accompanied by rising incomes and increased savings and investment. It also implies less burden on the working population of supporting the non-working portion of the population.

However, Table 13 shows that only 61 per cent of people in the working-age group are in the labour force in 1996. Those in the labour force include those employed, those unemployed and those engaged in the subsistence sector. Only 75 per cent of these are employed. The remaining 25 per cent cover the unemployed and those engaged in subsistence agriculture. Those not included in the labour force include those not working in the formal sector and those not looking for work, homemakers, students, disabled and those who are retired.

Table 13
Economic activity by ethnicity and current residence, population 15-59 years, 1996

| | Total population 15-59 years | Percentage in labour force | Employed (% of labour force) | Unemployed (% of labour force) | Subsistence (% of labour force) | Not in labour force (%) |
|---|---|---|---|---|---|---|
| Fiji | 461,106 | 60.9 | 75.0 | 5.9 | 19.1 | 39.1 |
| Fijian | | | | | | |
| Rural | 124,083 | 70.1 | 58.6 | 4.2 | 37.1 | 29.9 |
| Urban | 98,359 | 59.3 | 76.0 | 9.8 | 14.3 | 40.7 |
| Indian | | | | | | |
| Rural | 103,770 | 56.4 | 81.8 | 4.2 | 14.0 | 43.6 |
| Urban | 109,289 | 56.7 | 88.8 | 5.8 | 5.4 | 43.3 |

Source: Fiji Bureau of Statistics 1998a.

The fewer the employed in an economy the greater the burden on them of supporting the dependant population. In Fiji in 1996 only 46 per cent of the working-age group were employed and simultaneously supported their children and their elders. This is the narrow tax base for the country. Fiji in order to exploit the demographic bonus of the next few decades should ensure that employment is created to accommodate the increasing workforce. To increase economic growth the increasing working-age population must be employed.

Only 70 per cent of those aged 15-59 years of Fijians in rural areas were in labour force in 1996. Of these, a little over half were employed and 37 per cent were engaged in subsistence agriculture. In 1996 over 80 per cent of Indians in the labour force in rural and urban areas were employed. Unlike the Fijians a small proportion of Indian rural dwellers in the working-age group were engaged in subsistence farming. Most Fijians in the rural areas are engaged in the subsistence sector and are not part of the tax base of the country, thus reducing the employed proportion of the working-age group to 41 per cent.

### *5.4. Emigration*

This is a consequence of the North-South gap – the differentials in life expectancy, demography, economic structure, social conditions and political stability. Some governments see migration as economically vital because they hope migration will reduce unemployment and provide training and industrial experience and mainly for worker remittances. Migration has contributed to the loss of people with professional, technical and managerial skill resulting in the postponement of retirement of people with certain skills. In some cases outmigration of skilled personnel has led to unfilled civil service and private-sector vacancies and continuing recourse to international recruitment or inappropriate matching of jobs and qualifications.

### *5.5. The Oversupply of Labour*

The oversupply of labour in Fiji has encouraged the Government to maintain the retirement age at 55 years. Early retirement is encouraged and there is reluctance to retain or deploy elderly workers. Unemployment is high among the elderly and their main source of support is the family.

The oversupply of labour has also resulted in young people 18 years to 27 years migrating to the United Kingdom to serve in the military services. From year 2000 to 2003 about 2000 young men and a few women have left Fiji to serve in the British army. Nurses and other health personnel have also migrated in significant numbers. For a small country like Fiji these numbers are significant and the loss of valuable human resource is a constraint on future economic progress.

In addition as life expectancies continue to increase in developed countries more and more unskilled workers are needed to provide services and labour. A very small number of Fiji people are in the developed Pacific-rim countries working as carers for the elderly. These are mainly women, many of whom have retired and the work requires no specialized skill.

## 6. Old-Age Income Security

The demographic bonus will be available for 30 years, 2006-2036 and will be followed by a period of demographic turbulence when the elderly population and the dependency ratio increase. Fiji will begin to have this phenomenon in 2046.

Old-age security falls into two groups, provident fund and pensions. The provident fund was adopted by Fiji in 1966 to provide social security. Provident fund members are all wage earners and voluntary members, mainly those who are self-employed. The Fiji provident fund is fully funded and therefore not affected by the problem of population ageing.

In Fiji below half (46 per cent) of the population 15-55 years are employed and protected by superannuation benefits (Fiji Bureau of Statistics 1998a). Because it is fully funded it excludes a large proportion of the population such as those in the informal sector, those engaged in subsistence economy, the poor and the unemployed. The fund also offers pre-retirement benefits such as financial assistance for members in the area of home ownership, health care and education. Because of the low wages, the level of savings is low because provident fund members make use of the pre-retirement benefits denting their contribution significantly.

Because people are retiring early and living longer they have to spread their lifetime incomes and provident fund over the remaining

years of life. People therefore have to save more when working. However, people in Fiji use their provident fund while working, on home ownership, health care and education. The remaining fund will allow only considerably lower consumption in old age.

Table 14 shows that close to half of those 60 years or older and in the labour force were engaged in the subsistence sector in 1996. It appears that those people engaged all their lives in this sector continue to depend for their survival on the subsistence farming in old age because of the absence of old-age income security.

Table 14
Economic activity by ethnicity and current residence, population 60+ years, 1996

| | Total population 60+ years | Percentage in labour force | Employed (% of labour force) | Subsistence (% of labour force) | Not in labour force |
|---|---|---|---|---|---|
| Fiji | 39,807 | 42.3 | 51.4 | 44.1 | 57.7 |
| Fijian | | | | | |
| Rural | 15,226 | 57.5 | 42.1 | 55.2 | 42.5 |
| Urban | 6,755 | 35.4 | 41.4 | 2.0 | 64.5 |
| Indian | | | | | |
| Rural | 7,900 | 37.2 | 76.0 | 21.3 | 62.8 |
| Urban | 7,338 | 24.5 | 66.3 | 26.7 | 75.5 |

Source: Fiji Bureau of Statistics 1998a.

Women are particularly vulnerable. They tend to outlive men (Table 8). Many women in Fiji during their productive years are homemakers and outside wage employment. They therefore lack control of resources and wealth and so have no economic security, as they grow old.

In addition reduced fertility means fewer potential sources of economic, emotional and psychological support for the elderly. There is concern about the reduced availability of the social network of kin to provide support for the elderly. Many elderly people therefore face deprivation, marginalization and insecurity. The threat of poverty is real among Fiji's elderly.

## 7. Conclusion

The Fiji government needs to recognize the importance of the process of age-structural changes occurring in the country, and that it needs to take advantage of the demographic gift when the proportion in the working-age group increases. This can only happen if appropriate policies are pursued.

First the country needs to pursue a policy of human-resource development which it is now doing. This is essential in preparing the younger population for joining the workforce. Fiji is investing in education and health to ensure that educated and healthy people are entering the labour force each year.

Economic performance has been minimal in the last twenty-five years reflecting the almost stationary living standards. There have been shocks such as the political turmoils of 1987 and 2000 and natural disasters such as cyclones and droughts which have contributed to the poor economic performance. In the last few years the economy has rebounded registering an average of about 3 per cent growth in per capita GDP between 2001 and 2003. There is potential for improved economic performance. The government has to pursue all avenues to ensure political stability, enhancement of security and law and order, resolving the agricultural and land lease issue and strengthening good governance and efficiency of the public service.

High economic growth will in turn lead to having more people effectively and productively employed. This would result in more savings and more investments. More and more jobs must be created to maintain the current levels and to increase the proportion of the working population employed. This will be a challenge for the country.

Higher proportions of people employed mean that they would have secure and adequate source of income for their old age. All employees are members of Fiji's Provident Fund and the fund can be considered as a compulsory savings scheme accumulated over one's working years. It is paid in one lump sum to the worker on retirement; it can be converted into a pension. Having a higher proportion of employed in the labour force would ensure that the increase in the elderly population would have a secure income in old age. It could also contribute to Fiji's ability to develop sustainably. In addition, Fiji still has a chance of exploiting the window of opportunity.

**References**

ADB (Asian Development Bank) (2001) *Asian Development Outlook 2001. Part II: Economic Trends in Developing Asia.* http://adb.org/Documents/Books/ADO/2001/fj.asp.

ADB (Asian Development Bank) (2003a) *Asian Development Outlook 2003. Part II: Economic Trends and Prospects in Developing Asia.* http://adb.org/Documents/Books/ADO/ 2003/fiji.asp.

ADB (Asian Development Bank) (2003b) *Key Indicators of Developing and Pacific Countries. Vol 34*, http://adb.org/Documents/Books/key_indicators/2003.

BANK OF HAWAII (1998) *Fiji Economic Report. Trends in GDP Growth.* http://www.boh.com/econ/pacific/fj/fj_07-gdp.asp.

BANK OF HAWAII (2000) "An Update on Fiji", http://www.boh.com/econ/pacific/index.asp.

CHAND, A. and NAIDU, V (1998) *Legal Aspects of International Migration in Fiji*, Asia-Pacific Migration Research Network Working Paper No. 5.

FIJI BUREAU OF STATISTICS (1977) *Report on the Census of the Population 1976*, Parliament of Fiji, Parliamentary Paper No. 13 of 1977. Suva, Fiji.

FIJI BUREAU OF STATISTICS (1988) *Report on the Fiji Population Census 1986. Volume 1: General Tables*, Parliament of Fiji, Parliamentary Paper No. 4 of 1988. Suva, Fiji.

FIJI BUREAU OF STATISTICS (1989) *Report on the Fiji Population Census 1986: Analytical Report on the Demographic, Social and Economic Characteristics of the Population*. Suva, Fiji.

FIJI BUREAU OF STATISTICS (1998a) *1996 Fiji Census of Population and Housing: General Tables*, Parliamentary Paper No. 43 of 1998, Suva, Fiji.

FIJI BUREAU OF STATISTICS (1998b) *1996 Fiji Census of Population and Housing: Analytical Report. Part 1: Demographic Characteristics*, Parliamentary Paper No. 49 of 1998. Suva, Fiji.

FIJI MINISTRY OF FINANCE AND NATIONAL PLANNING (2002) *50/50 by Year 2020. 20-Year Development Plan (2001-2020) for the Enhancement of Participation of Indigenous Fijians and Rotumans in the Socioeconomic Development of Fiji*, Government Printing, Suva, Fiji.

FIJI MINISTRY OF HEALTH (1999) *Annual Report for the Year 1993 and 1994*, Parliament of Fiji, Parliamentary Paper No. 32 of 1999. Suva, Fiji.

HAUOFA, E (1993) "Our Sea of Islands", in Waddell, E, Naidu, V, and Hauofa, E (eds) *A New Oceania: Rediscovering Our Sea of Islands*, Suva, Fiji: SSED, University of the South Pacific.

REDDY, M *et al.* (2002) "Economic Costs of Human Capital Loss from Fiji: Implications for Sustainable Development", draft paper for the 5th International Conference of the Asia-Pacific Migration Research Network (APMRN), 24-26 September, 2002, Naviti Resort, Coral Coast, Fiji.

SHAH, S. (2003) "Fiji's Growth Recession", Paper presented at a seminar at the University of the South Pacific.

UNDP (1997) *Fiji Poverty Report*, UNDP and Government of Fiji, Suva.

UNITED NATIONS (1994) *Ageing and the Family. Proceedings of the United Nations International Conference on Ageing Populations in the Context of the Family*, New York, United Nations.

UNITED NATIONS (2003) *Economic and Social Survey of Asia and the Pacific 2003*, New York, United Nations, Economic and Social Commission for Asia and the Pacific.

ZWART, F H A G (1979) *Report on the Census of the Population 1976*, Vol II, Parliament of Fiji, Parliamentary Paper No. 43 of 1979.

# 9

# AGE STRUCTURE AND URBAN MIGRATION OF YOUTH IN THE PHILIPPINES

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***Abstract***

This paper extends the existing research on demographic transition and age-structural change by focussing on urban-rural variations in age structure within a country. This perspective highlights the role of internal migration in age-structure change and the size of youth populations in urban areas. With the current youth surge resulting from the demographic transition, a massive geographic redistribution of the Philippine population is underway, predominantly from less urbanized to more urbanized areas. The census of 2000 reveals that 10% of youth (aged 15-29) in the less urbanized areas and 19% in the National Capital Region are migrants, i.e., they had resided in another province or municipality five years earlier. Just as importantly, women outnumber men among these migrants: the higher the level of urbanization, the lower is the sex ratio of youth migrants. This age and gender selectivity of migration has important implications for both urban and rural populations. Age dependency ratios are significantly higher in rural areas than in urban

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The authors gratefully acknowledge the able research assistance of Nanette Lee and George Soria at the Office of Population Studies, University of San Carlos.

areas. While this could be interpreted as a demographic advantage to the urban population, it is clearly a disadvantage to the rural population. Also, migration has resulted in the "feminization" of urban and metropolitan populations and the "masculinization" of certain rural areas of origin. These shifts in age and sex structure have important demographic and policy implications.

## 1. Introduction

In the Philippines, as in other parts of the world, population concerns in both academic and policy settings have been strongly influenced by demographic transition theory. It was to be expected, therefore, that reduction of the population growth rate, primarily through fertility decline, would become the main interest of population experts in the country. Mortality and migration took a back seat in most demographic efforts. Even with the government's focus on the population-development nexus, and later the population-development-environment framework (Umali 1995; Cabrido 1994; Orbeta 1994), empirical investigations on population dynamics within these frameworks remained highly concentrated on fertility reduction and population growth.

Despite the focus on fertility and population growth, however, fertility decline in the Philippines has been painfully slow. Program efforts were stymied by a "lack of stable consensus" on the part of government and "persistent and consistent opposition by the Catholic Church hierarchy" (Herrin 2003: 4). As a result, the demographic transition of the country has been a protracted one. While the Philippines was among the earliest of its Asian neighbours to experience the onset of fertility decline, it will be among the last to complete the demographic transition (Xenos and Kabamalan 2005).

A concomitant feature of the demographic transition is the age-structural transition. Heightened interest in age-structural change initially focussed on the unprecedented increase in the number and proportion of the elderly, already a pressing concern for populations of most developed countries but not quite yet for most developing countries. For the latter, the focus has been on the "demographic bonus" or "window of opportunity" enjoyed (or anticipated) by populations that have recently completed the demographic transition. As explained by

Bloom *et al.* (2003: xii), the demographic transition produces "a 'boom' generation – a generation that is larger than those immediately before and after it – that is gradually working its way through nations' age structures." The "bonus" or "opportunity" presents itself when this 'boom' generation advances to the working ages and the population experiences an end to a regime of high child dependency burdens before the onset of increased old-age dependency. For this demographic "opportunity" to translate to an economic advantage, however, a suitable policy environment that ensures acceleration of the demographic transition and the productive employment of additional labour is required (Bloom *et al.* 2003).

Because of its sluggish fertility decline and drawn-out demographic transition, the Philippines enjoys no such "demographic bonus" (Herrin 2003; Pernia 2003). If fertility trends and the unfavourable policy environment persist, it will miss out on such a "window of opportunity" entirely. At the same time, the Philippines still has a long way to go before becoming an "old" population. At present, the "elderly" constitute only about six per cent of total population and will reach 10% sometime around 2020. Nevertheless, we show in this paper that the country's age-structural transition needs close attention for a quite different aspect of age-structural change.

Prior to the "final" stage of ageing (when persons aged 60 and over will comprise 10% or more of total population), each population in transition undergoes an intermediate stage of the "youth bulge" (when proportions and numbers of young adults peak prior to a final decline).[3] This youth-bulge stage calls for intensive study. It typically ushers in the onset of the "demographic bonus", on proviso that the youth wave is sufficiently large to offset younger age cohorts (i.e., fertility decline has been sufficiently steep) and appropriate policies are in place. In a decade or two, this youth cohort will advance to mid adulthood and the most economically productive stage in the life cycle.

The youth cohort is a most demographically potent force to reckon with because of its:

1) significance for fertility – this is the group mainly responsible for population momentum and subsequent age waves;

3. In this study we define youth as the population aged 15-29 years, a definition used by the National Youth Commission of the Philippines and deemed appropriate in labour-force related studies.

2) significance for migration, particularly rural-urban migration – since the propensity for geographic mobility is most pronounced during the youth stage of the life cycle and is often (clearly so in the case of the Philippines) strongly selective of one gender;
3) significance for the labour force and human capital;
4) close connection with recent transformations in the social composition of youth, and especially urban youth, which again has an important bearing on fertility, mortality and migration.

Geographic redistribution of the youth population can induce further age-structural changes at subnational levels. Even if there are only weak perturbations in the age-structural transition at the national level (as is the case for the Philippines), a different and more complex process may be taking place at the subnational level. This is apparent, for example, in differences in the age structure of urban and rural areas.

With respect to policy, age-cohort sizes and trends clearly have direct and immediate links to social and economic development. Programs and services are usually targeted for specific age groups and stages of the life cycle. Moreover, there is need for policy to be sensitive to geographic and sectoral differences in cohort sizes, characteristics and trends.

These considerations point to a unique demography of youth with important implications for age-structure changes at the national and subnational levels. In exploring this demography, we bring to the forefront the role of migration, a demographic process that has yet to be satisfactorily endogenised in demographic transition theory and, thus, in the age-structural transition.

## 2. Research Strategy

We extend the prevailing discourse on demographic transition and age-structural change in two ways. First, we examine spatial variations in age structure within a country by considering urban and non/less-urban areas separately, and looking at patterns in specific "highly urbanized areas". This brings into consideration the migration element of age-structure change that is all but mute at the national scale. It also focuses attention on the youth as that life stage has a strong propensity to migrate. Second, we examine compositional differences within the age group of interest, i.e., the youth cohort.

These extensions prove to be very important in the case of the Philippines. We extend the story of Philippine migration trends and selectivities through the end of the 20th century using newly available 2000 census data. We examine these trends and selectivities for urban youth in the National Capital Region (Metro Manila), in other highly urbanized cities outside the national capital, and in the remaining less-urbanized sector of the country. We then disaggregate the urban youth populations along age, sex, marital status, schooling, work and family dimensions for a more refined, albeit preliminary and partial, description of youth demography. The total picture suggests a broader model of Philippine demographic and age-structural change and at the same time provides a level of specificity needed for a sharper perspective on economic and welfare policy issues.

## 3. Philippine Demographic and Age-Structural Transitions

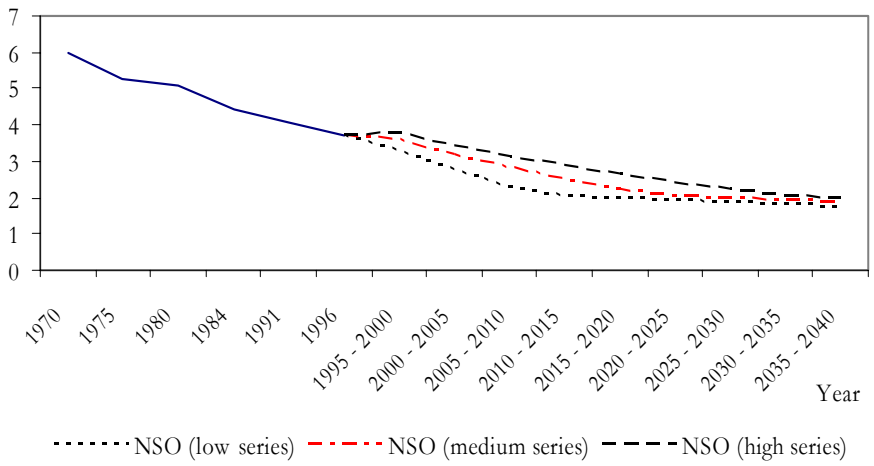
The onset of fertility declines in the 1960s heralded the beginning of Philippines' demographic transition (Xenos and Kabamalan 2005). However, given recent and current trends in fertility, this transition is far from over. Between 1970 and 1996, the total fertility rate of the Philippines decreased from 5.97 to 3.73 births (Figure 1). But the significant declines observed in the 1970s and 1980s failed to gain momentum in the 1990s. With the slow overall decline, the Philippines is not expected to attain replacement-level fertility before 2010 (Marquez and Westoff 1999) and more likely in the decade or two thereafter.[4] Intercensal growth rates echo this dilatory movement. After reaching a maximum of three per cent in the 1960s, growth rates gradually declined in the next two decades but have hovered above the two per cent level since then (Figure 2). The latest census set the annual growth rate for 1990-2000 at 2.3 per cent.

It is generally anticipated by expert observers that structural ageing of the population of the Philippines will continue to be relatively slow. The median age of the Philippine population was 19.7 years in 1990 and 21.0 years in 2000; it is expected to rise to 26.5 in 2015 and 28.4 years in 2020 based on the medium series projections of the Philip-

4. With respect to mortality, life expectancy at birth for men increased from 51.0 years in 1960 to 62.2 years in 1990; for women it was 54.5 years in 1960 and 67.4 years in 1990 (Flieger *et al.* 1981; Flieger and Cabigon 1994).

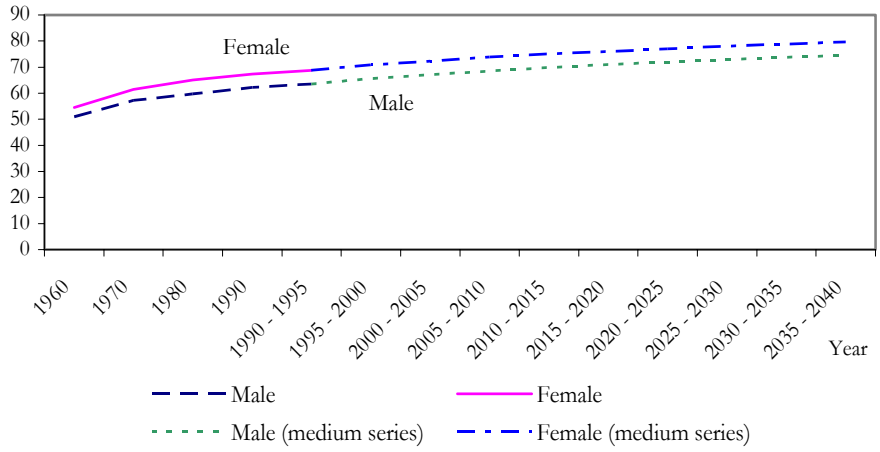
Figure 1
Fertility and mortality trends: Philippines

a) Total fertility rates: 1970-2040




Sources: 1970-1996 TFRs: National Statistics Office, Department of Health and Macro International, *National Demographic and Health Survey 1998*, Table 3.3, p. 36; 1995-2000 to 2035-2040 projected TFRs: NSO (1997), Vol. I, Table 1-1, p. 6.

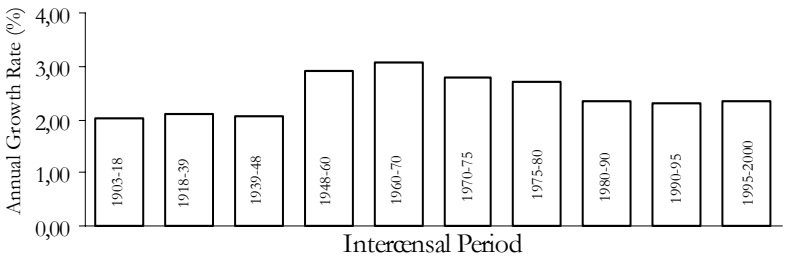
b) Male and female life expectancies at birth: 1960-2040




Sources: 1960: Flieger *et al.* (1981); 1970-1990: Flieger and Cabigon (1994); NSO (1997).

Source: Gultiano *et al.* 2003, Figures 4.3 and 4.4.

Figure 2
Population growth rate, by intercensal period: Philippines 1903-2000



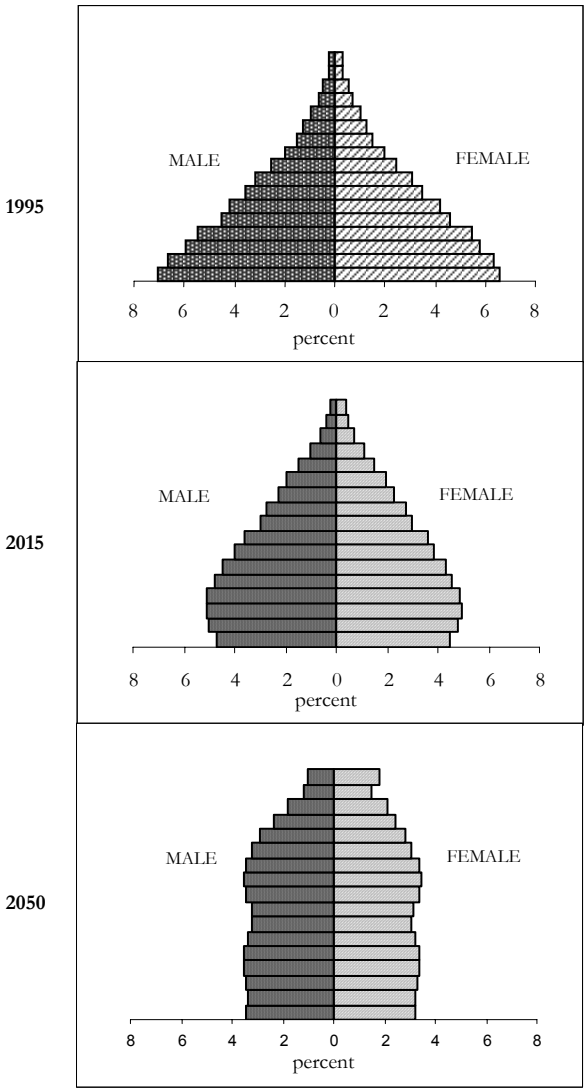

Source: Gultiano *et al.* 2003, Figure 4.1.

pines' National Statistics Office (NSO 1997; NSO 2002). Population pyramids drawn from UN projections for 1995, 2015 and 2050 likewise demonstrate this gradual ageing process (Figure 3).

A distribution of the population by broad age categories (Table 1) reveals the following features of the country's age-structural change up to year 2020: (1) the proportion of people under age 15 is declining, but their absolute number continues to rise until a reversal becomes apparent after 2010; (2) the elderly population (aged 60 and above) has doubled in number since the 1970s and could triple in this decade, but will not reach the 10% mark before 2020; (3) the proportion of youth (aged 15-29) has reached its peak and is now gradually on the decline, even as their numbers continue to rise until 2020; and (4) older adults (aged 30-59) are continuing to increase in number and proportion.

It is important to recognize the painful trade-offs that are inherent in the alternate paths a country might take. Rapid fertility decline and a relatively abrupt demographic transition is the experience of countries such as Singapore, Taiwan, Hong Kong and China, while relatively slow transitions are the experience of other countries, notably India, Malaysia, Myanmar, Brunei and the Philippines. Rapid transitions bring abrupt shifts in age composition and age-specific population growth rates, while slow transitions bring little such population disturbance but, instead, sustained high rates of population growth. Comparing Asian countries, Xenos (2004) estimates that the youth population of the Philippines (aged 15-24) will increase by as much as 259% in the 66 years that the Philippines will take to complete its demographic transition (Table 2). This compares with a youth population expansion of

Figure 3
Population pyramids: UN medium series projection, 1995, 2015, 2050




Source: Gultiano *et al.* 2003, Figure 4.1c.

Table 1
Population by major age groups: Philippines 1970-2020

| Age group | 1970[a] | 1980[a] | 1990[a] | 2000[b] | 2010[b] | 2015[b] | 2020[b] |
|---|---|---|---|---|---|---|---|
| | *in thousands* | | | | | | |
| 0-14 | 16,757 | 20,221 | 23,994 | 27,600 | 28,580 | 28,356 | 27,661 |
| 15-29 | 9,691 | 13,698 | 17,354 | 21,425 | 25,724 | 27,227 | 28,099 |
| 30-59 | 8,560 | 11,637 | 16,023 | 22,678 | 30,489 | 34,706 | 38,994 |
| 60+ | 1,646 | 2,542 | 3,188 | 4,645 | 7,075 | 8,727 | 10,753 |
| All ages | 36,684[c] | 48,098 | 60,559 | 76,348 | 91,868 | 99,016 | 105,507 |
| | *in per cent* | | | | | | |
| 0-14 | 45.7 | 42.0 | 39.6 | 36.1 | 31.1 | 28.6 | 26.2 |
| 15-29 | 26.4 | 28.5 | 28.7 | 28.1 | 28.0 | 27.5 | 26.6 |
| 30-59 | 23.4 | 24.2 | 26.4 | 29.7 | 33.2 | 35.1 | 37.0 |
| 60+ | 4.5 | 5.3 | 5.3 | 6.1 | 7.7 | 8.8 | 10.2 |

a. Census of Population and Housing, 1970, 1980, 1990.
b. NSO (1997), Vol. II, Table 2, p. 32 (medium series).
c. Includes about 30,000 individuals with ages unknown.
Source: Gultiano *et al.* (2003), Table 4.1.

well under 100% associated with the rapid demographic transitions in Taiwan and South Korea.[5]

Had it not been for this exceedingly slow passage through the demographic transition maintaining relatively high child dependency ratios up to recent times, the youth surge would have taken the Philippines into the threshold of a "demographic bonus". However, with shortcomings in population and economic policies, this "bonus" has not materialized thus far. Nonetheless, the ongoing shift in age structure now poses the immediate and continuing challenge of providing adequate economic opportunities, resources and services to an unprecedented number of people in the productive ages, a challenge that the Philippine economy is ill-equipped to face (Orbeta 2002) caught, as it is, in what economists call a low-level equilibrium trap (Pernia 2003: 2).[6]

5. Throughout Table 2 net migration of youth has some important effects, as with the high peak youth growth rates of Singapore, Hong Kong and Brunei.

6. Pernia (2003) describes this low-level equilibrium trap as "a chain of low economic growth, high unemployment, low productivity, persistent poverty, declining human capital and high fertility feeding back into low economic growth, high unemployment, low productivity and so on and so forth".

Table 2
Indicators of youth demography during demographic transition: countries of Asia

| Country | Onset of fertility decline (date) (1) | Duration of the demo-graphic transition (years) (2) | Peak youth share of total population (3) | Peak youth growth rate (4) | Peak youth population number (date) (5) | % growth of youth population during demographic transition (6) |
|---|---|---|---|---|---|---|
| Singapore | 1959 | 16 | 0.25 | 6.2 | 1980 | 112 |
| Taiwan | 1965 | 18 | 0.21 | 4.8 | 1980 | 54 |
| Hong Kong | 1960 | 20 | 0.23 | 9.8 | 1980 | 220 |
| China | 1969 | 21 | 0.22 | 5.4 | 1989 | 97 |
| South Korea | 1962 | 23 | 0.23 | 5.5 | 1981 | 83 |
| Thailand | 1968 | 32 | 0.22 | 3.6 | 1992 | 109 |
| Bangladesh | 1981 | 34 | 0.20 | 3.5 | 2004 | 78 |
| Indonesia | 1970 | 40 | 0.21 | 3.1 | 2005 | 104 |
| Pakistan | 1990 | 40 | 0.20 | 3.0 | 2033 | 100 |
| Nepal | 1988 | 42 | 0.20 | 2.2 | 2032 | 127 |
| Sri Lanka | 1962 | 43 | 0.21 | 2.8 | 2002 | 90 |
| India | 1973 | 47 | 0.20 | 2.5 | 2014 | 106 |
| Malaysia | 1966 | 49 | 0.22 | 4.8 | 2015 | 194 |
| Myanmar | 1976 | 49 | 0.20 | 2.5 | 2001 | 117 |
| Brunei | 1965 | 55 | 0.22 | 9.1 | 2012 | 443 |
| Philippines | 1963 | 66 | 0.21 | 3.2 | 2021 | 259 |

Note: Countries ordered by col. 2, duration of demographic transition (Japan excluded because of its seriously disrupted demographic transition) measured as the number of years from a 10% decline to when the NRR = 1.0; (5) is calculated from the onset of fertility decline to the date when the number of youth begins to decline.
Source: Xenos (2004), Table 4.

## 4. Age Structure at the Subnational Level

While the country as a whole is experiencing a relatively smooth and gradual shift in age structure (Figure 3), the same may not be true for geographic and sectoral components at the subnational level. For example, differences in age-structural patterns are noticeable when urban and rural populations are compared. First, one must consider that fertility rates are lower in urban areas than in rural areas. The National Demographic and Health Survey of 1998 reported that rural

women had 1.7 more births on average compared to their urban counterparts. They were marrying earlier and having their first child two years earlier than urban women (NSO 1999). Second, it is generally recognized that, while birth rates in rural areas exceed those of urban areas, rural children often leave their birthplace and move to the cities when they reach adolescence or young adulthood. Such is the pattern suggested in the population pyramids presented in Figure 4.

Comparing the 1990 age structure of the urban population with that of the rural population (1st panel of Figure 4), Flieger (1996) demonstrated the long-term effects of reduced fertility on the urban age structure. From the same demonstration, another fact emerged: there were more people of ages 15-45 residing in urban areas than in rural areas. This difference cannot be attributed entirely to declining levels of urban fertility; it is primarily the result of the migration of young adults from rural to urban areas. Moreover, the urban "excess" is predominantly female, particularly for age groups 15-29. That rural-urban migration in the Philippines is selective of young women has long been established by Smith (1977) and other demographers (e.g., Flieger 1977; and more recently, Gultiano and Urich 2000), a pattern true also for some other Southeast Asian countries and Latin America (Hugo 1999; Skeldon 1990). However, as will be explained below, this female selectivity in Philippine migration did not become apparent until the second half of the 20th century.

The age-structural differences between urban and rural areas remain in evidence in 2000 (2nd panel of Figure 4). Although the 2000 census has not yet provided a disaggregation of the Philippine population by urban-rural sector per province, it permits disaggregation by so-called "highly urbanized areas" (HUA) in the country.[7] In Figure 4, the 2000 population pyramid implies a persistence of age and gender selectivity in rural-urban migration.

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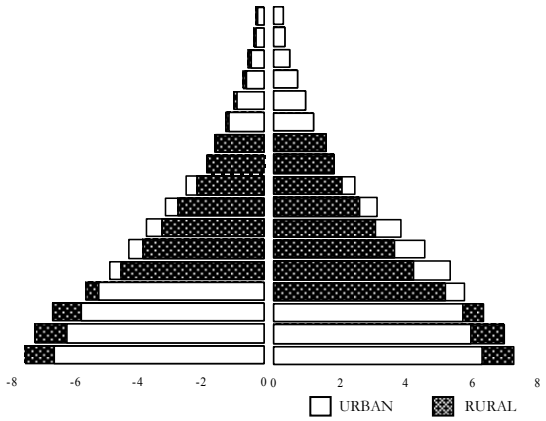
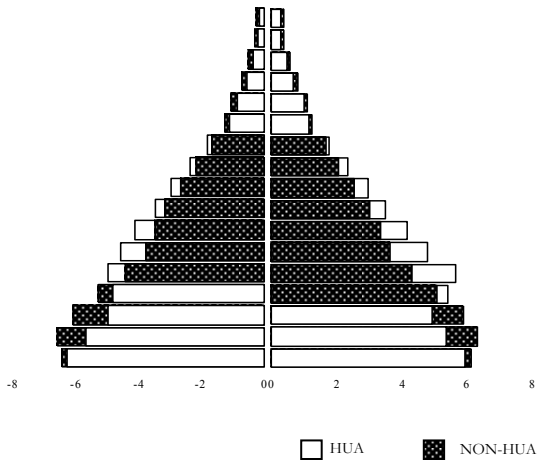
7. HUA consist of highly urbanized cities defined by NSO as having a population of not less than 200,000 and with the latest annual income of at least 50 million pesos based on 1991 constant prices. For all practical considerations, this study regards the National Capital Region (NCR) as the most highly urbanized area among the HUA.

Figure 4
Age-structural differences, Philippines: 1990 urban and rural populations, and 2000 highly urbanized and not highly urbanized populations




a) Age-structural differences: urban and rural Philippines, 1990




b) Age-structural differences: highly urbanized (HUA) and not highly urbanized (NON-HUA) areas, 2000

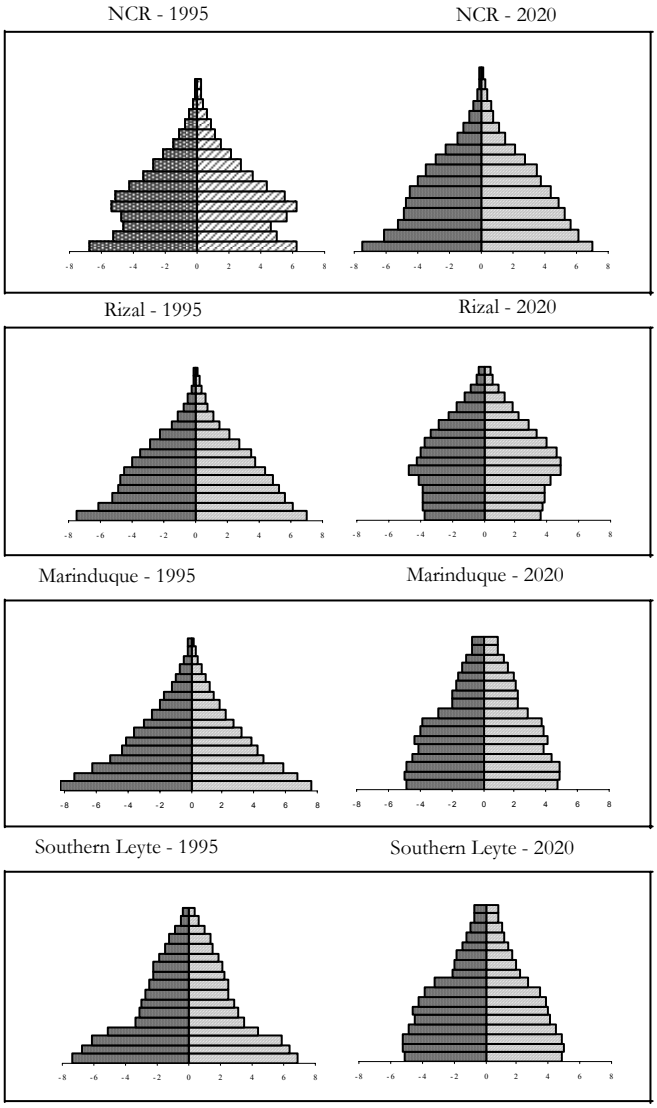
We present additional examples of age-structural differences for selected regions and provinces of the country (Figure 5). Further, we show how these existing structures (in 1995) are expected to change in the future (2020). The National Capital Region and the province of Rizal provide examples for the highly urbanized sectors of the country; the provinces of Marinduque and Southern Leyte illustrate the less urbanized (predominantly rural) sectors. It is evident from these diagrams that age-structural change for these geographic entities will not be as smooth as that of the country as a whole. Although the age-sex distribution for 2020 is derived from a specific set of fertility, mortality and migration assumptions, it can be surmised from the 1995 pyramids that migration, especially of youth, exerts a strong influence in shaping these distributions. It is generally expected that migration effects on age-structure transition are more pronounced at the subnational level than at the national level (Pool 2004: 5).

In the next section we turn our attention to the historical and contemporary trends of internal migration in the Philippines. Following that, we focus on youth migration and the social composition of youth migrants as glimpsed from 2000 census data. Possible implications of youth migration patterns are discussed in the concluding section.

## 5. Internal Migration in the Philippines

As shown earlier, the differences in age-sex distributions between urban and rural (or less urbanized) areas are indicative of youth and female selectivity in urban migration. This has been the general pattern of migration in the country from the 1960s through the end of the 20$^{th}$ century. However, the Philippine migration literature reminds us that this has not always been so. Male-dominated, largely frontier migration was the predominant pattern in earlier times. This was especially so during the time when land-rich Mindanao in the south was opened to land-deprived inhabitants of the northern island-provinces of the Visayas. As the Mindanao and other frontiers developed and urbanized, however, female migrants into these areas gradually increased, eventually comprising the majority of young frontier migrants as well (Eviota and Smith 1984). Today, the pre-eminence of women in Philippine migration, including international migration, is fully recognized. Nevertheless, a more detailed investigation is needed of the social char-

Figure 5
Population pyramids: NSO medium series projection, 1995, 2020
(selected geographic areas)




Source: Gultiano *et al.* 2003 (unpublished figures)

acteristics and age patterns of female migrants vis-à-vis non-migrants and their male counterparts, updated through the most recent census.

Much of the literature on internal migration in the Philippines is based on analysis of census and survey data in the 1970s and 1980s. The 1960 and 1970 censuses provided indirect data on migration by comparing a person's place of birth (for lifetime migration) or residence ten years ago (for period migration) with current residence; the 1973 National Demographic Survey provided data on the characteristics of migrants. In the 1990s, however, most of the interest in migration shifted to international migration, creating a dearth of knowledge on more recent patterns and trends in internal migration. From the earlier studies, a review has been provided by Herrin (1981) from which we select the following salient points:

- Up to 1960, lifetime migration was characterized by long-distance movements; it was unidirectional, frontierward and male-dominated. Distance was not a deterring factor in migration, especially among young migrants. With respect to sectoral flows, rural to rural migration was most prominent, followed by rural to urban, and rural to metro to a much lesser degree.
- In the 1960s and 1970s, long-distance movements prevailed but the destinations and social composition of migrants changed; the metropolitan pull and the predominance of women became evident; countercurrents to the dominant ones also became apparent. Sectoral flows ranked in significance as follows: rural to urban, rural to rural, rural to metro, urban to rural, and metro to metro.
- Age structure, measured as the proportion of population aged 20-29 at place of origin, was positively related to interregional, long-distance moves.
- Level of education was found to increase the probability of rural to urban migration for both males and females, but more prominently for males in rural to metro moves; it decreased the probability of urban to rural migration for both sexes and from rural to rural for females.
- Economic factors (income potentials) prevailed in the decision to migrate; once the economic criterion was met, family-related factors played a key role in the choice of destination.
- Older and more educated migrants were less likely to return to their places of origin.

With respect to occupational differentiation by migrant status and sex, the study of Eviota and Smith (1984) revealed the following:

- Native women were more likely to be working in high prestige occupations while their migrant counterparts were mostly working in the service and domestic sector.
- Educated male migrants were more likely to be in white collar and craftsmen positions while relatively educated female migrants remained largely in the service sector – that is, until a fairly high level of education (tertiary) was attained.

Although all these studies point to the importance of the youth cohort in migration, they do not give focus on the youth as migrants. In two recent studies, the present authors have focussed on the youth dimension. Xenos (2004) examined youth migration in four countries of Asia including the Philippines. Gultiano and others (2003), in a study commissioned by CICRED and the FAO, provide a complementary focus by emphasizing the deficit of youth in rural areas as a result of migration. Both studies present estimates of net migration for the youth age range and provide further evidence of urban/metropolitan destinations and female selectivity in youth migration. Xenos (2004) is particularly relevant because it situates youth urban migration in the context of the demographic and age-structural transition. It also provides an analysis of the changing social profile of urban youth, notably the shift to single status and increasing school participation of youth. The paper, however, makes no direct comparison between migrant and non-migrant youth. With the recently available census data for 2000, we now can provide the preliminaries for this comparison.

## 6. Urban Migration of Filipino Youth in Recent Times

As in previous censuses, migration information from the 2000 census used in this study is drawn from questions on current place of residence (province and municipality) and residence five years ago (1995). Residence five years ago was obtained only for persons aged five years and older. Unlike in the previous censuses, a person's place of birth was not recorded in the 2000 census; hence no analysis can be made of lifetime migration. In this section, we confine our attention to 5-year youth migrants, i.e., those whose current province or municipal-

ity of residence is different from that in 1995.[8] We define youth as those belonging to the age range 15-29. Also, as explained earlier, the 2000 census does not provide an urban-rural classification of populations. We, therefore, disaggregate populations into "highly urbanized areas" (hereafter referred to as HUA) and "less urbanized areas" (non-HUA). In most cases, the former is further disaggregated into the National Capital Region (NCR) or Metro Manila, and "highly urbanized cities outside NCR" (ONCR). Given these definitions – constrained by the nature of the census data – the following caveats are necessary: 1) migrants include all persons who transferred residence from one province/municipality to another within the last five years; therefore, their previous place of residence could be either urban or rural, and 2) while the NCR is 100% urban, ONCR has segments of rural population in its peripheries; the category non-HUAs, on the other hand, has small segments of urban population in the form of provincial capitals and town centres. Consequently, this study on urban migration of youth examines all types of youth migrants who, at the time of the 2000 census, were then residing in entirely or predominantly urban agglomerations, or in a predominantly rural one. Comparisons can therefore be made between migrant and non-migrant youth within, as well as between, these agglomerations.

Before we examine the migration of youth during 1995-2000, a general description of the Philippine population by urban typologies is in order (Table 3). The Philippines' household population numbered 76.3 million in 2000; 9.9 million (13%) resided in Metro Manila, 6.1 million (8%) in highly urbanized cities outside Metro Manila, and 60.3 million (79%) in the less urbanized areas.[9] The NCR had the lowest proportion of population under 15 years old (32.0%), while the non-HUA had the highest (38.1%). Similarly, the proportion aged 65 and over was lowest for the NCR (2.9%) and highest for the non-HUA (4.1%). In contrast, the youth share (aged 15-29) and the proportion of older adults (aged 30-64) were highest for the NCR (30.6% and 34.5%, respectively) and lowest for the non-HUA (26.9% and 30.9%). The

8. We attempted to identify rural-to-urban/metropolitan migration but a high percentage of 'no response' or 'don't know' responses for province and/or municipality of residence 5 years ago (over 50% of migrants) made the exercise futile.

9. These figures, and all others presented in this section, are values obtained from a 10% sample of the 2000 census data and could vary slightly from published (100%) data.

Table 3
Demographic characteristics, by urbanization level: Philippines 2000**

| | Non-HUA | All HUA | ONCR | NCR | Philip-pines |
|---|---|---|---|---|---|
| Population* | 60,304,951 | 16,008,530 | 6,128,428 | 9,880,102 | 76,313,481 |
| (% of total population) | (79.0) | (21.0) | (8.0) | (13.0) | (100.0) |
| Median age | 20 | 22 | 21 | 23 | 21 |
| % under 15 years old | 38.1 | 33.2 | 35.1 | 32.0 | 37.1 |
| % aged 15-29 (youth) | 26.9 | 30.3 | 29.7 | 30.6 | 27.6 |
| % aged 30-64 | 30.9 | 33.6 | 32.1 | 34.5 | 31.5 |
| % aged 65+ | 4.1 | 3.0 | 3.1 | 2.9 | 3.8 |
| % under 5 years old | 12.8 | 12.2 | 12.2 | 12.3 | 12.7 |
| Child-woman ratio | 0.524 | 0.424 | 0.441 | 0.41 | 0.500 |
| Sex ratio <5 years old | 104.9 | 105.2 | 104.8 | 105.5 | 105.0 |
| Sex ratio <15 years old | 104.4 | 104.1 | 103.5 | 104.5 | 104.3 |
| Sex ratio 15-29 (youth) | 103.2 | 90.6 | 92.4 | 89.5 | 100.2 |
| Sex ratio 30-64 | 102.6 | 98.5 | 99.6 | 97.9 | 101.7 |
| Sex ratio 65+ | 82.0 | 74.0 | 79.0 | 70.8 | 80.7 |
| Dependency ratio (DR) | 72.9 | 56.6 | 61.8 | 53.6 | 69.2 |
| Child DR | 65.9 | 52.0 | 56.8 | 49.2 | 62.7 |
| Old-age DR | 7.0 | 4.6 | 5.0 | 4.4 | 6.5 |
| % migrants age 5-14 | 12.5 | 16.7 | 14.5 | 18.3 | 13.3 |
| % migrants age 15-29 | 10.4 | 16.9 | 13.5 | 18.8 | 11.9 |
| % migrants age 30-64 | 8.4 | 11.3 | 9.0 | 12.6 | 9.0 |
| % migrants age 5-9 | 16.6 | 20.9 | 18.6 | 22.6 | 17.4 |
| % migrants age 10-14 | 8.1 | 12.0 | 10.2 | 13.4 | 8.8 |
| % migrants age 15-19 | 8.9 | 16.0 | 13.4 | 17.9 | 10.4 |
| % migrants age 20-24 | 11.1 | 18.1 | 14.4 | 20.3 | 12.8 |
| % migrants age 25-29 | 11.6 | 16.3 | 12.7 | 18.2 | 12.7 |
| % migrants age 30-34 | 10.6 | 13.8 | 10.8 | 15.5 | 11.4 |
| % migrants age 35-39 | 9.2 | 11.9 | 9.6 | 13.2 | 9.8 |
| % migrants age 40-44 | 8.3 | 10.4 | 8.6 | 11.4 | 8.7 |
| % migrants age 45-49 | 7.4 | 10.0 | 8.0 | 11.2 | 7.9 |
| % migrants age 50-54 | 6.8 | 9.5 | 7.8 | 10.4 | 7.4 |
| % migrants age 55-59 | 6.3 | 9.4 | 7.4 | 10.6 | 6.9 |
| % migrants age 60-64 | 6.2 | 9.7 | 7.9 | 10.8 | 6.9 |
| % migrants age 65+ | 6.5 | 10.0 | 8.2 | 11.2 | 7.1 |
| SR of migrants age 5-9 | 107.7 | 108.3 | 110.3 | 107.2 | 107.8 |
| SR of migrants age 10-14 | 101.1 | 97.1 | 95.0 | 98.3 | 100.1 |
| SR of migrants age 15-19 | 87.2 | 67.8 | 67.7 | 67.8 | 80.6 |
| SR of migrants age 20-24 | 80.8 | 72.3 | 74.6 | 71.4 | 77.8 |

(cont.)

| | | | | | |
|---|---|---|---|---|---|
| SR of migrants age 25-29 | 91.0 | 86.1 | 89.5 | 84.9 | 89.4 |
| SR of migrants age 30-34 | 96.8 | 97.3 | 95.2 | 98.1 | 97.0 |
| SR of migrants age 35-39 | 101.5 | 96.1 | 96.1 | 96.0 | 100.0 |
| SR of migrants age 40-44 | 105.1 | 96.7 | 97.1 | 96.6 | 102.8 |
| SR of migrants age 45-49 | 101.4 | 91.3 | 94.2 | 90.1 | 98.4 |
| SR of migrants age 50-54 | 100.9 | 85.5 | 95.1 | 81.7 | 96.4 |
| SR of migrants age 55-59 | 97.9 | 87.9 | 94.7 | 85.1 | 95.2 |
| SR of migrants age 60-64 | 85.6 | 76.9 | 82.1 | 74.6 | 83.3 |
| SR of migrants age 65+ | 69.2 | 62.2 | 64.3 | 61.1 | 67.6 |
| Sex ratio: migrant youth | 86.0 | 74.7 | 75.7 | 74.3 | 82.2 |
| Sex ratio: non-migrant youth | 105.4 | 94.1 | 95.3 | 93.4 | 102.9 |
| Sex ratio: migrants aged 30+ | 96.2 | 90.7 | 91.9 | 90.3 | 94.7 |
| Sex ratio: non-migrants 30+ | 100.3 | 97.0 | 98.2 | 96.3 | 99.6 |

* Weighted figures from a 10% sample of household population.
** HUA represents highly urbanized areas consisting of "highly urbanized cities". NSO defines highly urbanized cities as cities with a population of not less than 200,000 and with the latest annual income of at least 50 million Pesos based on 1991 constant prices. NCR, the national capital region, is considered as the most highly urbanized area in the country.

ONCR ranked mid-way between the NCR and the non-HUA. Given these age distributions, age dependency ratios were highest in the non-HUA (72.9) and lowest in the NCR (53.6).[10] Over 90% of the dependents were children.

When sex distributions in these age groups are examined (Table 3), a pattern of sex ratios consistent with the urban migration selectivities discussed earlier is brought to light: 1) males exceeded females in all but the oldest age group (aged 65 and over) in the non-HUA; 2) females outnumbered males in the youth and older ages in the HUA; and 3) the deficit of males (or excess of females) was most prominent among the youth in the NCR. What is being observed, therefore, is a "feminization" of the urban age structure, particularly in Metro Manila, presumably as a result of disproportionately large transfers of female youth from less to more urbanized areas.

The departure of young women from less urbanized areas appears to obscure the fact that fertility is higher in rural than in urban settings. The proportion of children under five years old in the non-HUA is not

10. From here on, it helps to bear in mind that the non-HUA sector constitutes a heterogeneous group of geographic and social aggregates and may well hide a wide range of variability in its estimates.

considerably higher than that of the HUA (as illustrated also in the population pyramid comparison for 2000), but when the child-woman ratio is computed, the expected fertility differential is upheld (Table 3).

In 2000, youth, that is the age group 15-29 years, constituted 27.6% of the Philippine population; their number reached 21 million, 16 million (77.0%) of whom were residing in the non-HUA, three million (14.4%) in Metro Manila, and close to two million (8.6%) in the HUA outside Metro Manila. Migrants constituted 11.9% of the youth, with the proportion considerably higher for the NCR (18.8%) and for females across all urbanization categories.

If migrants are examined by age group, the concentration of migrants in the youth ages (15-19, 20-24, and 25-29) is evident, especially in the HUA. There is one exception, however: migrants aged 5-9 years are considerably larger in proportion compared to youth migrants. With no data permitting a detailed investigation, one can only presume that these children had migrated with their parents. Voluntary migration, however, appears to be the prerogative of youth.

The sex composition of youth migrants is highly consistent with expectation, i.e., women dominate urban migration (sex ratio of 82.2), and the NCR attracts the largest proportion of women relative to men (sex ratio of 74.3). In addition, two qualifications bear noting; across all age groups under age 65: 1) the male deficit among migrants is most pronounced for age group 15-19 in the HUA (sex ratio of 67.8), and age group 20-24 in the non-HUA (sex ratio of 80.8), and 2) male migrants begin to outnumber their female counterparts in the older ages (35-54) in the non-HUA. This observation accentuates teenage women's attraction to metropolitan destinations. Among middle-aged men, less urbanized destinations seem to be the choice.

In other studies (Xenos 2004; Xenos and Kabamalan 2005), it has been shown that the social composition of youth has changed dramatically over time. Especially in urban and metropolitan settings, increasing proportions of youth are postponing marriage (remaining single) and attending school. Labour-force participation rates, however, show divergent patterns depending on age, sex, urbanization category and the country under study. In a preliminary fashion, we have examined these and related characteristics for migrant and non-migrant youth by sex for year 2000 (Table 4).

Contrary to expectations, migrant youth, in general, were more likely to be married (40.3%) than their non-migrant counterparts (32.5%),[11] with the exception of female migrants in the HUA who had slightly lower married proportions than non-migrants. This result may partly be an artefact of the data, given the caveats stated earlier. Furthermore, marital status was asked in reference to the time of interview and not the time of migration; it is not known, therefore, whether marriage had taken place before or after migration. It helps to bear in mind that marriage is one of the more common reasons for residential movement. As expected, marriage rates were uniformly higher for females than males although the gap tended to diminish at higher levels of urbanization. The marriage rate for migrants was highest in the non-HUA; curiously, it was lowest for the ONCR and not for the NCR.

Contributing perhaps to high marriage rates among youth in the NCR is the fact that cohabitation is more common in the metropolitan area than in other urbanized and less urbanized areas. It is also observed that cohabitation is more common among migrant than non-migrant youth. Nearly one in every four married migrant youth in the NCR was cohabiting.

More migrants (69.6%) than non-migrants (54.6%) reported having an occupation. For females, the proportion working was highest in the NCR and lowest in the non-HUA. For males, the proportion working was lowest in ONCR rather than in the non-HUA.

Regardless of their age and sex, non-migrant youth had higher enrolment ratios (40.9%) than migrant youth (25.7%). While migrants were more preoccupied with work, non-migrants, particularly in the younger ages, were preoccupied with schoolwork. Although there appear to be no pronounced sex differentials in enrolment ratios among the youth, there are indications that for migrants aged 15-19 in the HUA, more males than females were studying. Apparently, migrant women in this age group and urbanization category preferred to work.

In general, the high-school completion rate was higher among non-migrants (47.6%) than migrants (44.6%), except for the oldest age category (25-29) in the non-HUA where completion of high school was more common for migrants than non-migrants. Relatively more females (51.1%) than males (43.5%) completed high school, regardless

11. Marriage, as defined here, includes legal unions as well as common-law/live-in arrangements (referred to as 'cohabitation' in this paper).

Table 4
Selected characteristics of youth, by residence and migration status: Philippines, 2000

| | Non-HUA | | | HUA outside NCR | | | NCR | | | Philippines | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Migrant | Non-mig | Both | Migrant | Non-mig | Both | Migrant | Non-mig | Both | Migrant | Non-mig | Both |
| % Single[a] | | | | | | | | | | | | |
| All youth | 57.3 | 68.0 | 66.9 | 67.3 | 68.4 | 68.2 | 63.4 | 64.2 | 64.0 | 59.7 | 67.5 | 66.6 |
| Males | 65.0 | 74.2 | 73.3 | 71.1 | 73.0 | 72.8 | 66.3 | 67.8 | 67.5 | 65.9 | 73.3 | 72.5 |
| Females | 50.7 | 61.5 | 60.3 | 64.4 | 64.0 | 64.0 | 61.3 | 60.8 | 60.9 | 54.6 | 61.6 | 60.7 |
| % Ever-married[a] | | | | | | | | | | | | |
| All youth | 42.7 | 32.0 | 33.1 | 32.7 | 31.6 | 31.8 | 36.6 | 35.8 | 36.0 | 40.3 | 32.5 | 33.4 |
| Males | 35.0 | 25.8 | 26.7 | 28.9 | 27.0 | 27.2 | 33.7 | 32.2 | 32.5 | 34.1 | 26.7 | 27.5 |
| Females | 49.3 | 38.5 | 39.7 | 35.6 | 36.0 | 36.0 | 38.7 | 39.2 | 39.1 | 45.4 | 38.4 | 39.3 |
| % Cohabiting[b] | | | | | | | | | | | | |
| All youth | 18.9 | 13.5 | 14.2 | 19.4 | 16.4 | 16.8 | 23.5 | 19.1 | 19.9 | 19.8 | 14.5 | 15.3 |
| Males | 18.9 | 15.0 | 15.5 | 19.8 | 18.3 | 18.5 | 24.1 | 20.7 | 21.3 | 20.1 | 16.1 | 16.7 |
| Females | 18.8 | 12.4 | 13.3 | 19.2 | 15.0 | 15.6 | 23.1 | 17.8 | 18.9 | 19.7 | 13.4 | 14.3 |
| % with Occupation | | | | | | | | | | | | |
| All youth | 67.4 | 52.9 | 54.4 | 67.8 | 54.9 | 56.6 | 76.9 | 64.3 | 66.7 | 69.6 | 54.6 | 56.4 |
| Males | 79.5 | 65.1 | 66.4 | 75.0 | 62.9 | 64.4 | 83.0 | 71.4 | 73.4 | 79.8 | 65.7 | 67.2 |
| Females | 57.0 | 40.1 | 42.0 | 62.3 | 47.2 | 49.4 | 72.4 | 57.8 | 60.8 | 61.2 | 43.2 | 45.5 |
| % Attending school | | | | | | | | | | | | |
| All youth | 24.1 | 39.2 | 37.7 | 32.4 | 49.0 | 46.7 | 27.6 | 45.8 | 42.4 | 25.7 | 40.9 | 39.1 |
| Males | 24.8 | 38.3 | 37.0 | 33.5 | 49.1 | 47.2 | 28.8 | 46.7 | 43.6 | 26.5 | 40.2 | 38.8 |
| Females | 23.5 | 40.2 | 38.3 | 31.6 | 48.8 | 46.2 | 26.8 | 45.0 | 41.3 | 25.1 | 41.6 | 39.5 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| % with Sec. Educ. | | | | | | | | | | | | |
| All youth | 41.4 | 43.6 | 43.4 | 47.5 | 55.7 | 54.6 | 52.9 | 66.1 | 63.7 | 44.6 | 47.6 | 47.3 |
| Males | 37.9 | 39.6 | 39.4 | 46.4 | 52.2 | 51.5 | 52.9 | 63.9 | 62.1 | 41.9 | 43.7 | 43.5 |
| Females | 44.4 | 47.9 | 47.5 | 48.3 | 59.1 | 57.5 | 52.9 | 68.2 | 65.1 | 46.8 | 51.7 | 51.1 |
| % with Coll. Degree | | | | | | | | | | | | |
| All youth | 4.8 | 4.0 | 4.1 | 6.0 | 7.5 | 7.3 | 6.4 | 7.9 | 7.6 | 5.3 | 4.8 | 4.9 |
| Males | 4.2 | 3.0 | 3.1 | 6.1 | 6.2 | 6.2 | 6.2 | 6.9 | 6.8 | 4.8 | 3.7 | 3.8 |
| Females | 5.3 | 5.1 | 5.1 | 6.0 | 8.7 | 8.3 | 6.5 | 8.9 | 8.4 | 5.6 | 6.0 | 5.9 |
| % Idle | | | | | | | | | | | | |
| All youth | 20.3 | 21.5 | 21.4 | 15.4 | 16.3 | 16.2 | 13.0 | 14.3 | 14.0 | 18.1 | 20.1 | 19.9 |
| Males | 8.5 | 11.4 | 11.1 | 8.5 | 9.6 | 9.4 | 7.3 | 8.3 | 8.1 | 8.3 | 10.7 | 10.6 |
| Females | 30.3 | 32.2 | 32.0 | 20.7 | 22.8 | 22.4 | 17.2 | 19.8 | 19.3 | 26.2 | 29.7 | 29.2 |
| % Idle: Single | | | | | | | | | | | | |
| All youth | 11.7 | 15.4 | 15.1 | 10.1 | 11.2 | 11.1 | 8.5 | 9.8 | 9.5 | 10.8 | 14.3 | 14.0 |
| Males | 10.9 | 13.7 | 13.5 | 10.3 | 11.3 | 11.2 | 9.2 | 10.0 | 9.9 | 10.5 | 13.1 | 12.9 |
| Females | 12.7 | 17.4 | 17.0 | 10.0 | 11.2 | 11.0 | 8.0 | 9.5 | 9.2 | 11.1 | 15.8 | 15.3 |
| % Idle: Married | | | | | | | | | | | | |
| All youth | 31.1 | 34.3 | 33.9 | 25.5 | 26.9 | 26.7 | 19.8 | 22.0 | 21.6 | 28.2 | 31.9 | 31.4 |
| Males | 4.5 | 4.9 | 4.8 | 4.6 | 5.0 | 4.9 | 4.0 | 4.9 | 4.7 | 4.4 | 4.9 | 4.8 |
| Females | 47.7 | 55.4 | 54.3 | 38.7 | 42.8 | 42.2 | 30.3 | 35.3 | 34.2 | 43.3 | 51.5 | 50.2 |
| % Domestic[c] | | | | | | | | | | | | |
| All youth | 5.3 | 4.7 | 4.7 | 9.9 | 5.5 | 6.2 | 7.7 | 4.9 | 5.5 | 6.3 | 4.8 | 5.0 |
| Males | 3.6 | 3.6 | 3.6 | 5.2 | 4.3 | 4.4 | 4.3 | 4.3 | 4.3 | 3.9 | 3.7 | 3.7 |
| Females | 7.4 | 6.5 | 6.6 | 14.1 | 7.0 | 8.4 | 10.7 | 5.7 | 6.9 | 9.0 | 6.4 | 6.9 |

(cont.)

Table 4 (cont.)

| | Non-HUA | | | HUA outside NCR | | | NCR | | | Philippines | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Migrant | Non-mig | Both | Migrant | Non-mig | Both | Migrant | Non-mig | Both | Migrant | Non-mig | Both |
| % Elem. occup.[d] | | | | | | | | | | | | |
| All youth | 10.7 | 9.5 | 9.7 | 17.8 | 14.0 | 14.6 | 15.8 | 13.7 | 14.1 | 12.7 | 10.5 | 10.8 |
| Males | 9.6 | 8.6 | 8.7 | 13.0 | 14.3 | 14.1 | 13.5 | 15.2 | 14.9 | 10.8 | 9.9 | 10.0 |
| Females | 12.0 | 11.1 | 11.2 | 22.2 | 13.6 | 15.2 | 17.8 | 11.9 | 13.3 | 14.7 | 11.5 | 12.0 |
| % Exec./Prof.[c] | | | | | | | | | | | | |
| All youth | 5.5 | 4.9 | 5.0 | 6.1 | 9.1 | 8.6 | 7.4 | 11.1 | 10.3 | 6.0 | 6.2 | 6.2 |
| Males | 4.5 | 3.3 | 3.5 | 6.7 | 8.0 | 7.8 | 7.8 | 10.1 | 9.7 | 5.5 | 4.6 | 4.7 |
| Females | 6.7 | 7.6 | 7.5 | 5.4 | 10.5 | 9.6 | 7.1 | 12.3 | 11.0 | 6.7 | 8.8 | 8.4 |
| % Unrelated to household head | | | | | | | | | | | | |
| All youth | 7.1 | 1.4 | 2.0 | 17.0 | 4.3 | 6.0 | 16.9 | 4.9 | 7.1 | 10.3 | 2.1 | 3.1 |
| Males | 5.0 | 1.0 | 1.4 | 10.0 | 2.4 | 3.4 | 10.0 | 2.9 | 4.1 | 6.6 | 1.4 | 2.0 |
| Females | 8.8 | 1.9 | 2.6 | 22.3 | 6.0 | 8.4 | 22.0 | 6.7 | 9.8 | 13.3 | 2.9 | 4.2 |

a. Excludes non-response cases on marital status (1.1% of all youth, 3.0% of migrant youth, 4.9% of migrant youth in NCR).
b. Per cent of ever-married youth.
c. Per cent of youth with occupation.
d. Elementary occupations include low-status, low-paying, frequently intermittent jobs in the service sector, including market/ambulant vendors, domestic helpers, cleaners, messengers, and various types of labourers.

of their migration status. Completion rates were also positively associated with level of urbanization, i.e., they were highest for NCR.

Completion of college shows a slightly different picture. Non-migrants retained their edge over migrants only in the HUA. In the non-HUA, especially among older youth (aged 25-29), more migrants, male and female, had completed college compared to non-migrants.[12] As expected in the Philippines, more women (5.9%) than men (3.8%) had a college degree; among those aged 25-29, the corresponding figures are 10.5% and 7.4%, respectively. The NCR showed no distinct advantage over the ONCR insofar as completing tertiary education among the youth is concerned.

Some 29.2% of female and 10.6% of male youth were neither working nor studying. Migrant youth, in general, were less likely to be "idle" than non-migrants. The highest proportion of idle youth was found in the non-HUA, the lowest, in the NCR. It is important to take marital status into account in these observations. Separating out married from single youth, the data show that 15.3% of single females and 12.9% of single males were neither working nor studying. Among those who had married, as high as 50.2% of females and a low of 4.8% of males were in this category. The proportion idle remains consistently higher for non-migrants compared with migrants. It decreases with level of urbanization for all youth, regardless of their marital or migration status. Among the single youth, the proportion idle is slightly higher for men than for women in the HUA, but the opposite is true for the non-HUA.

More females (6.9%) than males (3.7%) were employed as domestic workers. These proportions are higher for migrant youth than for non-migrants. The highest proportion of domestic workers is found among female migrant women in ONCR (14.1%); The NCR only ranked second (10.7%). A similar pattern is observed for the youth working in "elementary" occupations.[13] In both instances, migrant females were the most likely to be selected into these occupations.

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12. Many of these youth had probably moved to the nearest city for the purpose of pursuing a college education and then remained there in search of jobs after graduation.

13. Elementary occupations, as defined by the census, include low-status, low-paying, frequently intermittent jobs in the service sector, including market/ambulant vendors, domestic helpers, cleaners, messengers, and various types of labourers.

With respect to managerial, supervisory, and professional occupations, women, in general, had an advantage over men (8.4% vs. 4.7% of all working youth, and 15.8% vs. 7.9% of those aged 25-29). This advantage, however, was the prerogative of non-migrant women in the HUA. Migrants, both men and women, in the HUA were less likely to be working as executives or professionals. The situation is slightly better for migrant males in the non-HUA: more of them were working as executives/professionals than their non-migrant counterparts; however, the overall level of male executives and professionals in this category is quite low (4.5% of migrants and 3.3% of non-migrants who are working).

With respect to household and family arrangements, most youth (85.2%) belong to the nuclear family of the household head. However, fewer migrants (69.1%) than non-migrants (87.3%) fall in this category, especially among female migrants in the NCR. In fact, a large proportion of the female migrants in the HUA (22%) are not related to the household head. This fraction is remarkably high for the youngest age group 15-19 (30.6% in ONCR and 28.6% in NCR). As mentioned earlier, large proportions of young female migrants in these areas work as domestics or in "elementary" occupations (including sales).

It is also of interest to describe the households of youth (data not shown):

- Two out of every three households in the country had at least one youth as resident; one in every ten had a migrant youth.
- In the HUA, the proportion of households with a migrant youth was expectedly higher: 12% in ONCR and 16% in NCR.
- Households with migrant youth were more likely to have a younger, unmarried head than households without a migrant youth.
- Households with migrant youth were likely to be of higher socioeconomic status than other households (i.e., they had a higher proportion of heads who were high-school or college graduates and had a managerial/supervisory/professional job). These households were most prominent in the HUA.
- Households of migrant youth were also likely to be headed by a migrant, and more likely to say they intended to move or change residence in the future.
- Households of migrant youth had fewer members under age 15 and over age 64; they had fewer members who were studying and more members who were working.

## 7. Discussion

Compared with most other Asian countries, the Philippines' journey through the demographic transition has been extremely slow. Replacement-level fertility is not expected to be attained before 2020 or so. Yet, because fertility had started its descent some 40 years ago, age-structural changes of the population are underway. The country has experienced a surge in its youth population and will continue to do so for some time. Although the proportion of youth in the population has started to decline, the number of youth will still be increasing up to around the year 2021.

For some Asian countries, the experience of the youth bulge brought with it a "window of opportunity" for rapid economic growth as the proportion of their economically active population markedly increased concomitant with a precipitous decline in the proportion of children. It has been estimated that the demographic bonus "contributed as much as one-half of recorded growth in Southeast Asia and about one-third in East Asia between 1965 to 1990" (Orbeta 2003: 2).[14] Such is not the case for the Philippines, however. Because fertility remains at relatively high levels, the dependency burden remains high, and no perceptible economic gains can be made from the youth surge. High unemployment rates are exacerbated by increasingly large numbers of young people entering the labour force. With the persistence of poverty and high fertility, investment in human capital has declined. All these translate to a cycle of low productivity, low economic growth, high unemployment, and so on. This clearly shows that a healthy economy is a requisite for transforming the potential benefits of age-structural change into reality. In the case of the Philippines, there is neither this demographic nor economic advantage.

Perhaps a more disturbing feature of the country's age-structural transition is the youth dynamics hidden behind the "youth bulge". The Philippines now has a tradition of female-dominated urbanward and metropolitan movement of youth. In the context of the youth surge, the result for the country is an augmentation of the youth population in the urban setting (particularly in metropolitan areas). More importantly, this "augmentation" is biased in favour of women. A "feminization" of the urban age structure has ensued, and in some instances possibly a "masculinization" in the places of origin.

14. More conservative estimates are mentioned in Bloom *et al.* (2003: 45).

This feminization of the urban population as a result of migration has important demographic implications. The cohort size of childbearing women in the urban areas could grow substantially thereby increasing momentum effects on growth in these areas. The converse, on the other hand, will be true for the rural areas.

It has been observed that migrants tended to be married or to marry earlier than non-migrants. Although this is true for all male migrants regardless of their areas of destination, it is not the case for migrant women in the metropolitan areas. These women tended to postpone marriage as did their non-migrant metropolitan counterparts. Whether these migrant women will adopt low-fertility childbearing practices when they marry remains to be seen, however. As noted, migrant women had lower educational attainment than non-migrants, a characteristic hardly advantageous for lowering fertility.

Another implication of the dominance of women in the urban sector is on ageing. Assuming that the desire to return to place of origin diminishes with age and educational attainment as observed in earlier studies, then many of these migrant women will opt to stay in the urban areas and grow old there. Moreover, as depicted by data, female selectivity in urban migration persists even beyond the youth ages. Given that life expectancy is higher for women than men, the urban sector would do well to anticipate the needs of a disproportionately large and growing number of elderly women.

A more immediate concern of the urban sector, however, relates to employment. Migrants, particularly women, are still generally confined to low-paying jobs in the service or domestic sector. They also have lower school participation and completion rates than long-time residents. Two decades ago, Eviota and Smith (1984) lamented government's lack of sensitivity to the plight of migrant women and their place in the urban labour market. To this day, no significant improvements in this area are visible. These women, no doubt, stand a lot to gain if programs directed at enhancing their skills, education, employment rights and benefits, and personal autonomy were put in place. Some mechanism, however, needs to be devised to reach these women in the most effective way.

Thus far, this paper has been relatively silent on the consequences of youth migration in rural and less urbanized areas. As this study and an earlier study by CICRED in the Philippines have shown (Gultiano *et al.* 2003), places of origin, especially in the rural areas, may be experi-

encing high dependency ratios concurrent with a deficit of youth due to urban migration. The deficit, however, is more conspicuous for women than men. The implications of this youth deficit for the agricultural sector are far-reaching. Agricultural productivity in the country needs a boost as much as its general economy does. This may not be forthcoming if rural areas are left with children and old people, or with a less educated, low-initiative labour force. It is possible that a more effective agrarian reform program could help slow down the exodus of youth from rural areas – assuming that land tenure security leads to increases in productivity and income – but agrarian reform implementation in the Philippines has been dismal. The Comprehensive Agrarian Reform Program (CARP) is wrought with virtually insurmountable political, economic and cultural barriers. This is unfortunate because, among other reasons, youth who do not have the necessary means, education or skill to migrate to the cities find themselves farming on public and protected lands resulting in the degradation of the environment (Gultiano *et al.* 2003). Other avenues for rural development must therefore be pursued, such as revitalizing non-farm and off-farm employment. Many agricultural households draw income outside of agriculture. If income opportunities for the young in the rural areas are improved, the push factor for migration can be mitigated. This is important because "migrants responding primarily to minus factors at origin tend to be negatively selected" (Lee 1966: 56) and negative selectivity does not bode well for the life chances of migrants in urban destinations.

There is also the issue of remittance benefits to be gained by rural households from urban migration. This has been found, even in the Philippines, to be fairly insignificant. Remittances more often find their way to conspicuous consumption rather than investment in land or human capital. In cases where rural families send their children to the cities for a college education, the flow of resources is even in the opposite direction. But perhaps a redeeming aspect of female-dominated urban migration is that, in the Philippines, women, more than men, are likely to send back remittances to their rural families. These women, as well as their male counterparts, should be encouraged to maintain ties with their rural origins, especially if the relatives they leave behind are children and the elderly. This can be facilitated by improving communication and transportation infrastructure in the rural areas. Infrastructure development will also promote commuting and circular migration,

processes anticipated to become more pronounced in the advanced stages of the mobility transition (Skeldon 1990: 112).[15]

After all this is said, the question remains: what is the future of the age structure of the Philippine rural population. Will the rural population stagnate or decline as more young women leave rural areas? Or will high fertility continue to compensate? Also, given the economic and personal insecurities faced by young migrant women in the metropolitan areas (e.g., intermittent and low-paying jobs, high incidence of cohabitation), will child fostering (by grandparents in the rural areas) become a common and acceptable practice? To what extent, if at all, will this practice affect dependency burdens in the rural areas? With considerable reservations, one may perhaps suggest that, owing to youth migration, the current urban or metropolitan age structure in the Philippines approximates conditions of a "demographic bonus". If this were so, one must ask: are the appropriate policies in place to enhance and exploit this urban demographic advantage? And what does this "bonus" mean if it is obtained at the expense of the rural population? How then ought policy to address these urban-rural demographic disparities and the positive and negative consequences they bring? Obviously, more studies are needed to answer these questions.

**References**

BLOOM, D, CANNING, D, and SEVILLA, J (2003) *The Demographic Dividend: A New Perspective on the Economic Consequences of Population Change*, RAND, Santa Monica, CA.

CABRIDO, C (1994) *Integration of Population Dimension in the Environment and Natural Resources Management Sector: Planning Framework, Tools and Techniques, and Illustrative Cases*, National Economic and Development Authority, Manila.

EVIOTA, E, and SMITH, P C (1984) "The Migration of Women in the Philippines", chapter 9 in Fawcett, J and Khoo, S (eds), *Women in the Cities of Asia: Migration and Urban Adaptation*, The Westview Press, Boulder, Colorado.

FLIEGER, W (1977) "Internal Migration in the Philippines During the 1960s", *Philippine Quarterly of Culture and Society*, 5: 199-231.

15. Skeldon (1990) provides a modified version of Zelinsky's (1971) mobility transition model and it is Skeldon who brings gender explicitly into his model. Both models present a description of a spatial-temporal link between the demographic and mobility transitions in the context of modernization.

FLIEGER, W (1996) "The Philippine Population 1980-1990: Selected Demographic and Socioeconomic Characteristics", *Journal of Philippine Development*, 232: 209-210.

FLIEGER, W, and CABIGON, J (1994) *Life Table Estimates for the Philippines, Its Regions and Provinces by Sex: 1970, 1980 and 1990*, Department of Health, Manila.

FLIEGER, W, ABENOJA, M, and LIM, A (1981) *On the Road to Longevity*, University of San Carlos Publications, Cebu City.

GULTIANO, S, and URICH, P (2000) "Exploring the Implications of the 'Youth Bulge' on the Agricultural Sector in the Philippines", Paper presented at the IUSSP/APN Conference on "Age-structural transitions and policy implications" in Phuket, Thailand, 8-10 November 2000.

GULTIANO, S, URICH, P, BALBARINO E, and SAZ, E (2003) *Population Dynamics, Land Availability and Adapting Land Tenure Systems: Philippines, a Case Study*, FAO and CICRED, Paris.

HERRIN, A N (1981) *Population and Development Research in the Philippines: A Survey*, National Economic and Development Authority, Manila.

HERRIN, A N (2003) "Lack of Consensus Characterizes Philippine Population Policy", *Policy Notes* No. 2003-03, Philippine Institute for Development Studies, Manila.

HUGO, G (1999) *Gender and Migrations in Asian Countries*, IUSSP, Gender in Population Studies Series, Paris.

LEE, E S (1966) "A Theory of Migration", *Demography*, 3(1): 47-57.

MARQUEZ, M P, and WESTOFF, C (1999) *The Two-Child Norm in the Philippines*, Macro International Inc., Calverton, Maryland.

NSO (NATIONAL STATISTICS OFFICE) (1997) *1995-Census Based National and Regional Population Projections*, Vol. 1, Manila.

NSO (NATIONAL STATISTICS OFFICE) (1999) *Philippine National Demographic and Health Survey 1998: Summary Report*, Manila.

NSO (NATIONAL STATISTICS OFFICE) (2002) *2002 Philippine Yearbook*, Manila.

ORBETA, A (1994) *A Planning Framework for Social Development*, National Economic and Development Authority, Manila.

ORBETA, A (2002) "Population and Poverty: A Review of the Links, Evidence and Implications for the Philippines", Discussion Paper Series No. 2002-21, Philippine Institute for Development Studies, Manila.

ORBETA, A (2003) "Population and the Fight Against Poverty", *Policy Notes* No. 2003-04, Philippine Institute for Development Studies, Manila.

PERNIA, E M (2003) "Population: Does It Matter? Revisiting an Old Issue", *Policy Notes* No. 2003-02, Philippine Institute for Development Studies, Manila.

POOL, I (2004) "Of 'Demographic Dividends', 'Windows of Opportunity' and Development: Age Structure, Population Waves and Cohort Flows", Paper presented at the CICRED seminar on "Age-Structural Transitions: Population Waves, Disordered Cohort Flows and the Demographic Bonus" in Paris, 23-26 February 2004.

SKELDON, R (1990) *Population Mobility in Developing Countries: A Reinterpretation*, Belhaven Press, London.

SMITH, P (1977) *The Evolving Patterns of Interregional Migration in the Philippines*, East-West Population Institute Reprint No. 104, 16(1-2).

UMALI, N R (1995) *Integrating the Population Dimension in Agricultural Development Planning*, National Economic and Development Authority, Manila.

XENOS, P (2004) "Demographic Forces Shaping Youth Populations in Asian Cities", chapter 1 in Hanley, L, Ruble, B, and Tulchin, J (eds), *Youth, Poverty, and Conflict in Southeast Asian Cities*, Woodrow Wilson International center for Scholars, Washington, DC.

XENOS, P, and KABAMALAN, M (2005) "Modern Age and Social Structural Transitions of Asian Youth", chapter 4 in Tuljapurkar, S, Pool, I, and Prachuabmoh, V (eds), *Riding the Age Waves*, Springer, New York.

ZELINSKY, W (1971) "The Hypothesis of the Mobility Transition", *Geographical Review*, 61: 230-231.

# *Part III*

# *SURFING IN TURBULENT CONDITIONS*

# 10

# BONUS OU MALUS DEMOGRAPHIQUE EN ROUMANIE

**Cornelia MURESAN**[1]

***Résumé***

La transition des structures par âge est une conséquence mais aussi une composante de la transition démographique. Entre deux problèmes démographiques perçus comme « malus », l'accroissement excessif de la population et le vieillissement, se trouvent une ou plusieurs périodes de « bonus » démographique. Les « fenêtres démographiques » ouvertes pour la population de la Roumanie sont transformables, mais avec difficulté, en périodes de « bonus » à cause de nombreuses turbulences dans sa pyramide des âges. Ce chapitre décrit la pyramide des âges de la Roumanie au dernier recensement (2002) en faisant référence aux deux autres pays en situation similaire : la Russie et la Chine en l'an 2000. Puis on analyse la nature et le processus de la transition de la structure par âge en Roumanie, avec des données rétrospectives et des indices dérivés des trois variantes de projections pour la période 2002-2055. Dans le futur plus ou moins proche, différents mécanismes sont possibles, actionnés par l'accroissement du poids des grands groupes d'âges fonctionnels qui peuvent générer des « bonus » démographiques pour le développement durable, mais tout dépend de l'ampleur des turbulences et du degré d'adéquation des politiques publiques mises en place. L'analyse statistique de corrélation entre le développement économique et la structure par groupes d'âges fonctionnels pour la période 1960-2000 montre que ces mécanismes, sources potentielles de « dividendes », n'ont guère fonctionné dans le passé. On se demande si après l'an 2000, quand on aura d'autres périodes d'oppor-

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tunités démographiques et quand l'économie sera davantage guidée par les règles de l'économie de marché, il sera possible d'en profiter ?

## 1. Introduction

Une des plus vieilles craintes concernant l'évolution de la population a été sa capacité de croissance excessive en rapport avec le potentiel de développement économique. C'est l'idée développée à la fin du XVIII^e^ siècle par Malthus, dont le *Principe de population* a déclenché l'essor de la démographie comme science académique. Aujourd'hui, cette crainte n'existe plus, ou du moins elle n'est plus généralisée au niveau planétaire. Les croissances accélérées observées au XIX^e^ siècle dans les populations européennes ont été remplacées peu à peu par des évolutions moins rapides, puis nulles, et une nouvelle théorie, celle de la transition démographique, nous a montré comment le développement économique conduit à l'arrêt de la croissance et à la stabilisation de la population. La transition démographique est achevée aujourd'hui dans les pays développés, aucun ne croît plus, et dans tous les autres pays du monde, elle est bien installée. La crainte de la multiplication excessive de la population n'existe plus, au moins pour le long terme. En outre, dans un grand nombre de pays, le déclin, la croissance négative, est d'ores et déjà en place.

Mais une autre crainte est à l'ordre du jour : celle du vieillissement démographique. Celui-ci est vu comme une conséquence du processus de transition démographique, qui instaure des régimes démographiques dont les structures par âges sont beaucoup plus vieilles qu'à l'origine. De plus, si la transition de la fécondité continue, en se maintenant longtemps en dessous du niveau nécessaire au remplacement des générations, on assistera à une diminution des effectifs de population et à une accentuation de l'inversion de la pyramide des âges allant bien au-delà des scénarios couramment attendus.

Donc, en schématisant, on peut dire qu'il y a deux défis majeurs pour les diverses populations aux différentes étapes de leur développement : la croissance rapide et le vieillissement accentué. Les deux problèmes sont décalés dans le temps parce qu'ils interviennent, d'une part, au commencement du processus de transition démographique et, d'autre part, après l'installation de la baisse de la fécondité, en général

bien plus tard. Ils sont caractérisés par un rapport de dépendance accru, mais de nature totalement différente : si, pendant la première étape de la transition de la structure par âge, la proportion des jeunes est celle qui pèse le plus dans le rapport, pendant la dernière étape, la proportion des vieux est largement prépondérante. Les deux situations sont lourdes d'implications pour le développement économique, en raison de la présence, dans chaque cas, d'une grande proportion d'inactifs au sein de la population.

Les démographes économistes ont attiré l'attention sur le fait qu'entre ces deux périodes de malus démographique, il y a une période de bonus, nommée « fenêtre d'opportunité », quand la part des groupes d'âges actifs augmente et que le rapport de dépendance diminue, période qui peut devenir une phase d'essor économique. Pendant une telle période, les dépenses du secteur social sont diminuées à cause d'une demande réduite de services de santé, correspondant à une population où jeunes et vieux sont moins nombreux, et aussi d'une demande plus faible de services d'éducation à cause du déclin de la population d'âge scolaire. Le cas le plus typique d'une telle situation a été observé dans les pays d'Asie de l'Est, où le « miracle économique » s'est produit pendant une telle période de bonus démographique. Navaneetham (2002) cite plusieurs études qui ont montré que la transition de la structure par âges a beaucoup influencé la croissance économique par l'accroissement de l'investissement et de l'épargne, et plusieurs recherches sur des pays asiatiques et non-asiatiques qui ont trouvé que l'accroissement des effectifs de population en âge de travailler a positivement influencé la croissance économique, tandis que l'accroissement de la population totale a eu un effet négatif.

Mais il y a quelques populations pour lesquelles la période de fenêtre démographique est caractérisée non seulement par un rapport de dépendance bas (en général), mais aussi par une forte variation des effectifs des générations qui arrivent dans les divers groupes d'âges fonctionnels ou en sortent. Ce sont les populations marquées par des vagues démographiques multiples et surtout celles qui présentent de fortes turbulences démographiques. La question qui se pose ici est de savoir si ces situations peuvent être considérées comme des périodes de bonus (ou d'opportunité) démographique pour un développement durable ou si, au contraire, elles peuvent dégénérer en périodes de malus démographique.

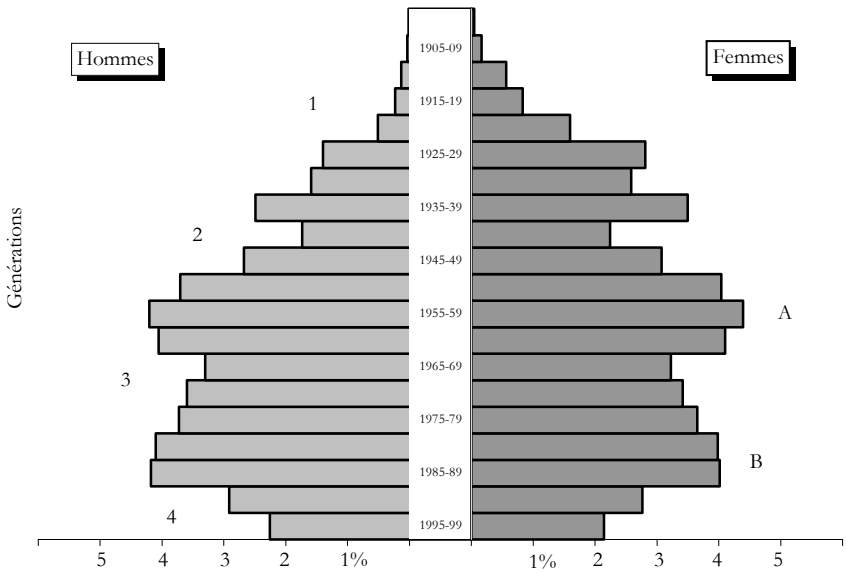
Nous n'allons pas analyser tous les pays qui font partie de cette catégorie, mais, avant d'examiner la seule situation de la Roumanie, jetons un coup d'œil sur les pyramides des âges de quelques autres pays, pour observer que les grandes turbulences sont toujours associées avec des revirements politiques majeurs.

Caselli *et al.* (2001) citent trois exemples de fortes turbulences démographiques : la Russie, la Chine et la Roumanie. Les pyramides des âges de ces pays (figure 1, a-c) présentent des irrégularités discernables même sur la variante par groupes d'âges quinquennaux.

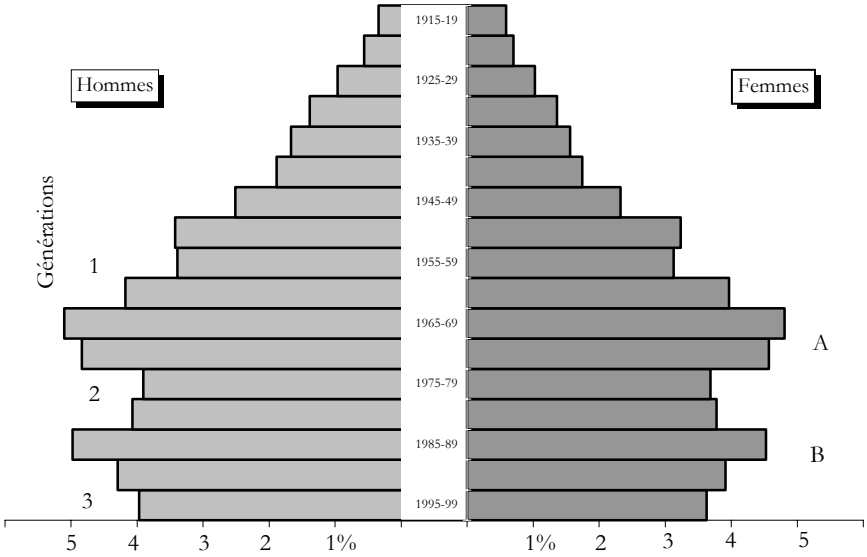
Pour la Russie, la Seconde Guerre mondiale a eu des conséquences sur la pyramide des âges encore visibles en 2000. Non seulement les pertes massives (près de 20 millions de morts) provoquent un premier creux dans le haut de la pyramide (point 1), surtout du côté des hommes, mais le déficit des naissances des années 1940-1944 (point 2) a été si grand qu'il a continué de générer, par un effet d'écho à intervalles d'environ 25 années, deux autres creux (points 3 et 4). La vague des

Figure 1
Pyramides des âges en 2000 : Russie, Chine, Roumanie

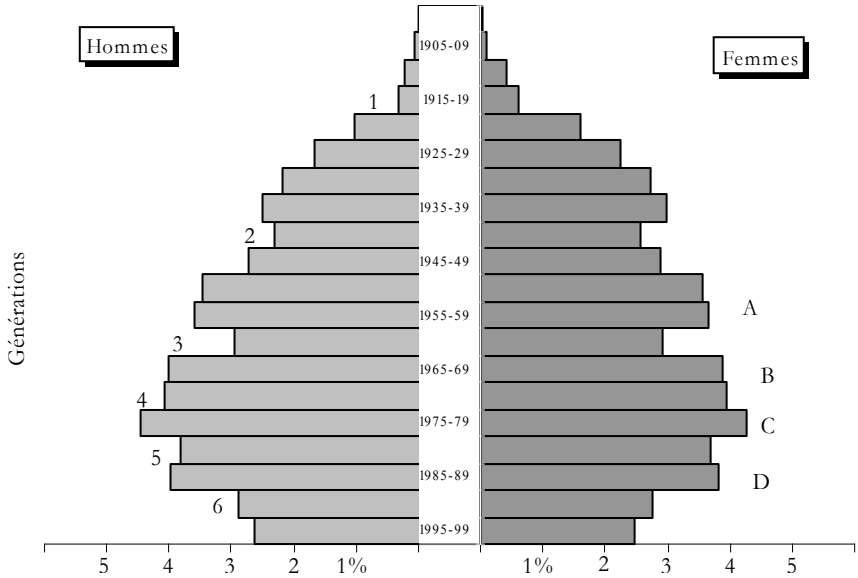
a) Russie



b) Chine (http://www.census.gov/ipc/)




c) Roumanie



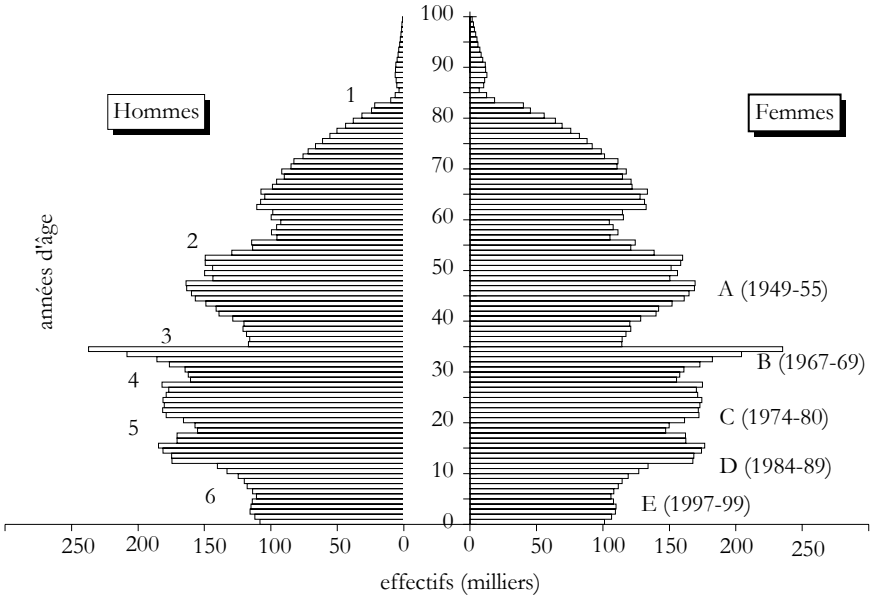
années 1980 (point B) est encore plus accentuée, car elle est due aussi aux effets des politiques natalistes mises en place a l'époque. Après 1990, quand la transition vers une économie de marché a anéanti ces politiques, les effectifs des naissances ont chuté de moitié en seulement dix ans (de 1989 à 1999).

Sur la pyramide de la Chine, on voit aussi trois creux (points 1, 2 et 3) et deux vagues (A et B ; voir aussi le chapitre de Yan Hao dans ce livre). Le premier creux correspond (en partie) à la période 1959-1962, celle du « grand bond en avant ». Non seulement ce brutal changement politique a provoqué entre 15 et 30 millions de morts (Caselli *et al.*, 2001), mais la crise a entraîné un effondrement de la natalité (moins visible sur la pyramide des âges par groupes quinquennaux), tant en raison des séparations forcées de nombreux couples que de l'attitude des autres qui ont évité de mettre au monde des enfants voués à la famine, et la mortalité due à la crise a particulièrement frappé les nourrissons. Le deuxième creux (2), du milieu des années 1970 au milieu des années 1980, commence avec le lancement de la politique de l'enfant unique et est ensuite accentué par l'effet d'inertie du premier creux. Le deuxième creux suit la vague des années 1960 et 1970 (A) correspondant au revirement politique de la « grande révolution culturelle », dont on peut percevoir l'effet d'écho 20 ans plus tard (vague B sur la figure).

La pyramide des âges par groupes quinquennaux de l'an 2000 de la Roumanie présente encore plus de vagues et de creux que celles de la Russie et de la Chine. On peut les suivre de plus près sur une pyramide plus détaillée et plus récente, construite avec les données du recensement du 18 mars 2002 (figure 2).

En dehors des deux creux du haut de la pyramide (points 1 et 2) et des vagues correspondantes, dues aux déficits de naissances des deux guerres mondiales, les autres creux (3, 4, 5 et 6) et quatre des autres vagues (A, B, C et D) sont liés non seulement aux perturbations cycliques générées par l'effet d'écho et à la chute tendancielle de la fécondité, mais aussi à l'histoire des réglementations concernant l'avortement. Après un « petit baby boom » (vague A, 1949-1955) de seulement 6-7 années après la Deuxième Guerre mondiale, s'est instaurée une tendance persistante de chute de la fécondité. Celle-ci a produit un déficit de naissances, qui s'est encore accentué avec la légalisation (en 1955) puis la libéralisation (1957) de l'avortement (voir le creux 3, 1957-1966, sur la figure 2). Pendant une dizaine d'années, les naissances ont diminué année après année (de presque 443 000 en 1957 jusqu'à 273 000 en

Figure 2
Structure par âge de la Roumanie au recensement de 2002




1966). En 1966, le gouvernement roumain a brusquement décidé d'interdire l'avortement, largement utilisé jusqu'alors, ce qui a obligé de nombreuses femmes enceintes à mener à terme leur grossesse et a provoqué un excédent brutal de naissances l'année suivante (vague B). Jusqu'à la chute du régime socialiste (à la fin de 1989), la tendance séculaire à la chute de la fécondité a été contrecarrée, avec plus ou moins d'efficacité, par des mesures natalistes. Parmi celles-ci, l'application de la loi qui interdisait l'avortement, renforcée en 1973 et 1984, a créé deux autres vagues (C et D), plus petites. Globalement, cette extraordinaire parenthèse de 23 ans dans la transition démographique en Roumanie n'a finalement produit qu'une légère remontée de la natalité, un surplus de population estimé à environ 2 millions d'habitants (Muresan, 1996) et un ralentissement du vieillissement, éléments considérés comme positifs et souhaitables par le gouvernement et la population roumaine. Mais, en même temps, d'autres conséquences, moins positives, d'ordre socio-économique ou d'ordre psychologique, ont été générées par l'incapacité d'adaptation des institutions (maternités, écoles, logements, marché du travail, etc.), les frustrations des parents et la

naissance en grand nombre d'enfants non désirés, souvent perturbés et mal acceptés par les familles et la société.

Après 1990, un autre creux (point 6 sur la pyramide des âges) marque une nouvelle étape de « normalisation » des comportements. L'avortement a été de nouveau libéralisé et, peu à peu, ont été mis en place des programmes de planification familiale, interdits pendant la période nataliste. Le nombre de naissances a chuté d'année en année, avec une baisse de fécondité allant jusqu'au niveau de 1,3 enfant en moyenne par femme pour l'indicateur conjoncturel. La structure par âge favorable à la natalité n'a influencé que très peu l'évolution, sauf si l'on excepte une faible vague (E) entre 1997-1999, exclusivement due à un effet d'inertie.

Nous allons considérer ici d'autres aspects de la transition de la structure par âge en Roumanie. Nous allons d'abord présenter la spécificité de son processus de transition démographique. Puis, pour identifier les périodes de fenêtres démographiques, nous allons voir les étapes de la transition de la structure par âge. Les turbulences des divers groupes d'âges fonctionnels vont être suivies dans leurs évolutions passées et futures, en faisant référence aux implications politiques. La dernière partie va être une analyse des liens entre le développement économique, notamment la croissance du produit interieur brut, et le changement de la structure par âges pendant la période 1960-2000. Cette période fait certainement partie de la deuxième étape de la transition de la structure par âge, celle des « vagues démographiques » (Pool, 2000).

## 2. Facteurs et spécificité de la transition démographique et de la transition des structures par âge en Roumanie

### *2.1. Les étapes de la transition démographique*

Le moment du déclenchement de la transition démographique en Roumanie et sa périodisation ont été un sujet de controverse dans la littérature démographique internationale et nationale. Même si ce n'est pas le sujet principal de ce chapitre, il faut dire, en quelques lignes, que le dépouillement récent des données de l'état civil des provinces historiques roumaines a permis l'utilisation de statistiques plus comparables

qu'avant, et plus fiables que celles retenues dans la littérature internationale. Basant son analyse sur des données représentant toutes les provinces historiques qui forment la Roumanie actuelle, au lieu de celles de l'ancien royaume seulement, Ghetau (1997) a avancé l'hypothèse que la mortalité a commencé à baisser régulièrement non pas à la fin du XIX^e^ siècle, mais vers le milieu du siècle. La deuxième phase de la transition démographique, c'est-à-dire le déclenchement de la baisse de la fécondité, a commencé, elle aussi, environ 35 ans plus tôt (vers le milieu des années 1880, au lieu de 1920), comme le montre la littérature internationale (Chesnais, 1987) ou même la littérature nationale antérieure. Pour dater la fin de ce processus séculaire, les choses sont plus complexes, non seulement pour la population de la Roumanie, mais pour les autres pays aussi, parce que, sur ce point, la théorie présente une faiblesse et est fortement contestée. En outre, comme nous l'avons vu, la Roumanie présente une étrange parenthèse historique, la période 1967-1989, marquée par une forte ingérence législative dans le comportement reproductif « naturel ». Nous laissons donc cette problématique à la lecture de ceux qui sont intéressés (Muresan, 1999a) et nous examinons la seule transition de la structure par âge.

### *2.2. Les facteurs: évolutions passées et projections*

La nature et le processus de la transition de la structure par âge dépendent de l'évolution des mêmes facteurs que ceux de la transition démographique elle-même : la nature et la vitesse de l'évolution de la fécondité et de la mortalité. Les figures 3 et 4 montrent l'évolution de l'indicateur conjoncturel de fécondité et de l'espérance de vie à la naissance pour la période 1950-2000, complétée par les valeurs utilisées dans les projections jusqu'en l'an 2060. Ce chapitre utilise trois variantes de projection de la population de la Roumanie calculées par l'auteur avec un programme spécifique. Ces trois variantes sont hypothétiques (scénarios), sans avoir la prétention d'être des prévisions, soit parce qu'elles prolongent la fécondité et la mortalité observées en 2000, soit parce qu'elles considèrent un redressement, imprévisible à ce jour, de la fécondité et/ou de la mortalité.

Le scénario « Redressement 2050 » a pour base une hypothèse de redressement graduel de la fécondité, tel qu'elle atteigne 1,5 enfant par femme en l'an 2010 et arrive à la valeur nécessaire pour le remplace ment des générations en 2050. Le niveau observé en 2000 est de 1,3, il

Figure 3
Évolution de l'indicateur conjoncturel de fécondité,
valeurs observées et valeurs projetées

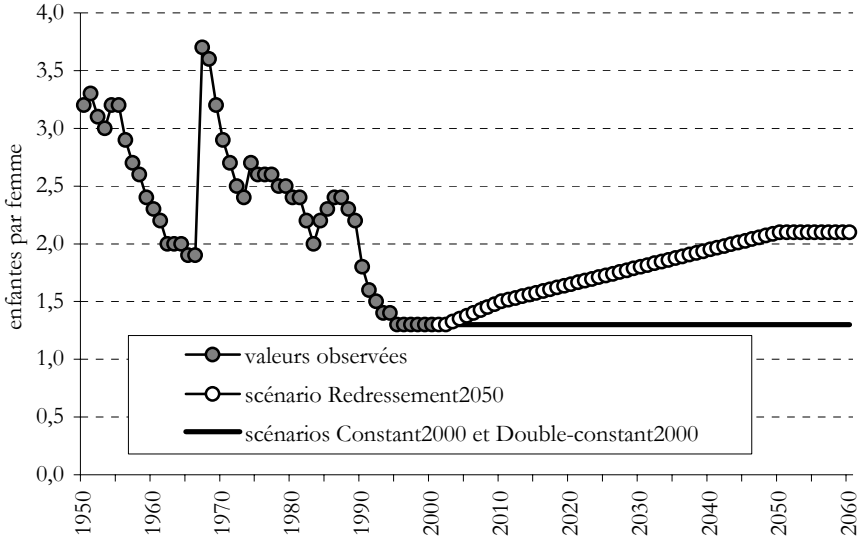
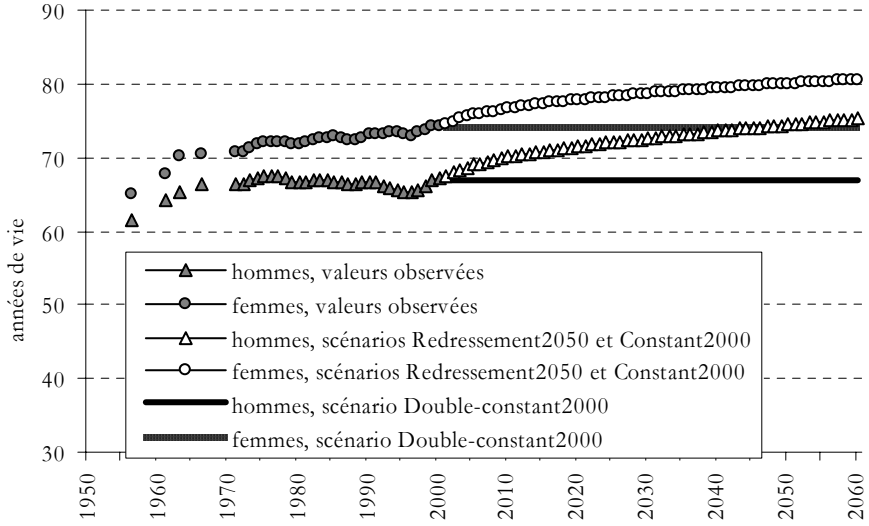



Figure 4
Évolution de l'espérance de vie à la naissance,
valeurs observées et valeurs projetées



n'a guère baissé depuis 1997, et il est considéré comme fixe pour toute la durée des scénarios « Constant 2000 » et « Double-constant 2000 ». Pour la mortalité, on a considéré un progrès continu de 0,015% d'augmentation annuelle de chaque probabilité perspective de survie à chaque âge pendant toute la durée de projection. La dernière table de mortalité publiée par l'Institut National de Statistique, qui s'appuie sur les données de la période 1998-2000, a été utilisée comme modèle de départ. Peu à peu, avec le progrès, les hommes devront réaliser un accroissement de leur espérance de vie à la naissance, de 67 ans en 2000 jusqu'à 70 ans en 2010 et 74,5 ans en 2050. Les femmes, qui partent d'une espérance de vie à la naissance de 74,2 ans, devront atteindre 76,6 ans en 2010 et 80 ans en 2050. Deux de nos scénarios de projections démographiques, « Redressement 2050 » et « Constant 2000 », utilisent une hypothèse d'évolution positive de la mortalité, tandis que le troisième, « Double-constant 2000 », qui sert seulement de référence, suppose la mortalité inchangée au niveau de 1998-2000.

Les fortes variations de la fécondité ont été, en règle générale, à la baisse si nous considérons la longue durée, mais avec des revirements conjoncturels après l'interdiction de l'avortement (3,7 enfants par femme en 1967 contre 1,9 en 1966) ou pendant les années de renforcement du contrôle public de la reproduction, 1974-1980 et 1984-1987. Ces variations ont contribué fortement aux flux désordonnés des naissances, produisant au cours du temps des entrées et des sorties inégales dans les sous-populations des divers groupes d'âges fonctionnels. Même l'évolution de la mortalité n'a pas été très régulière. Toujours à la baisse jusqu'à la deuxième moitié des années 1970, les évolutions positives se sont amoindries entre 1984 et 1987 ou entre 1990 et 1996, et elles ont même pris une orientation négative (recrudescence) pour les hommes (Muresan, 1999b). Après 1997, les évolutions positives sont revenues.

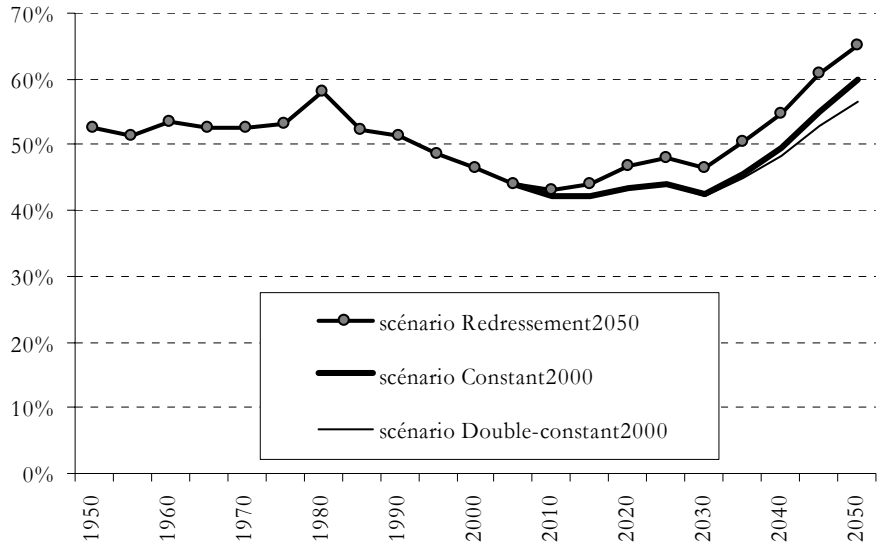
### *2.3. Les étapes de la transition de la structure par âge*

Si le déroulement des étapes de la transition démographique est jugé notamment en rapport avec le taux d'accroissement naturel, celui de la transition de la structure par âge est jugé principalement en fonction de l'évolution du rapport de dépendance. La « fenêtre d'opportunité » démographique est une période où la série de ces rapports a des

valeurs basses ou une allure descendante, entre deux périodes où les valeurs sont plus élevées.

La figure 5 montre l'évolution du rapport de dépendance (nombre des jeunes de 0-14 ans et des vieux de 65 ans et plus pour 100 personnes de 15-64 ans). L'horizon temporel de 100 ans (1950-2050) nous permet de percevoir une fenêtre démographique située entre 1995 et 2030 selon la variante de projection « Redressement 2050 », et encore plus longue (entre 1995 et 2045) selon les deux autres variantes qui ne supposent aucune évolution à la hausse de la fécondité. Le critère appliqué ici est une valeur inférieure à 50% du rapport de dépendance. Pourtant, on peut observer que l'évolution n'est pas du tout régulière et graduelle, et qu'il y a deux points de minimum relatif, vers 2010 et vers 2030. Cette situation résulte d'une structure par âge très perturbée, avec des flux désordonnés d'entrées et de sorties, soit en excédent soit en déficit, aussi bien dans les cohortes d'âges actifs que dans celles d'âges inactifs.

Figure 5
Evolution du rapport de dépendance, 1950-2050,
selon la variante de projection



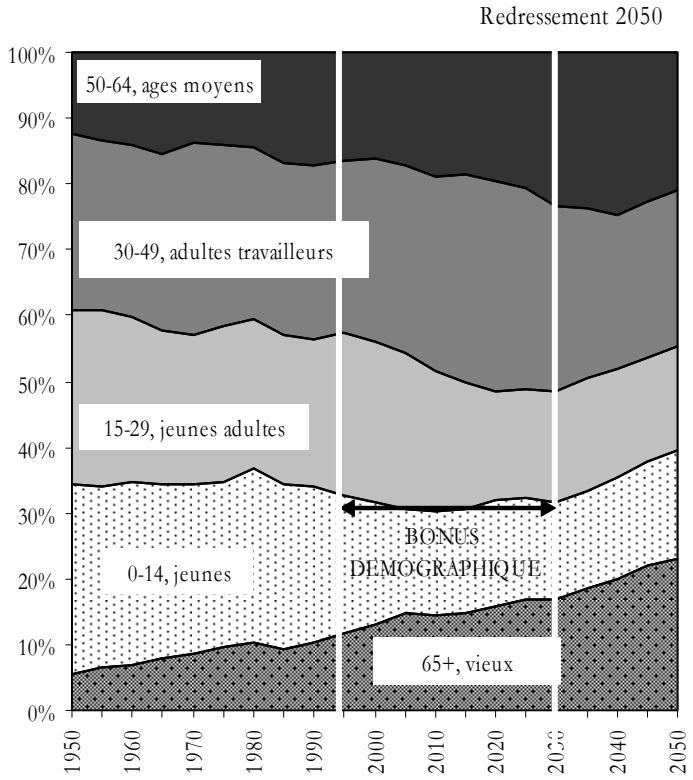
Mais une fenêtre démographique ne se réduit pas seulement à la diminution du rapport de dépendance pendant le passage d'une structure par âge jeune vers une plus âgée, elle comprend aussi des modifications au sein même des groupes d'âges adultes, avec des conséquences intrinsèques sur le marché du travail et la fiscalité.

### *2.4. La théorie du cycle de vie*

L'analyse plus détaillée des effets positifs ou négatifs de cette période est possible si nous considérons, par exemple, la théorie du cycle de vie, dont l'origine revient à Modigliani. Elle a été utilisée par Lindh et Malmberg (1999), qui ont défini la classification de la structure par âge en concordance avec les comportements économiques : 0-14 ans, les jeunes (*young*) ; 15-29 ans, les jeunes adultes (*young adulthood*) ; 30-49 ans, les adultes travailleurs (*prime age*) ; 50-64 ans, les adultes d'âge moyen (*middle age*) ; et 65 ans et plus, les vieux (*old age*). Ainsi, les jeunes dépendent des adultes pour leur consommation, et ils sont à l'origine de dépenses budgétaires de santé et d'éducation. Les jeunes adultes, eux aussi, sont exposés aux dépenses de santé et d'éducation, mais leur type de consommation n'est pas le même, leurs besoins étant différents. Ils sont à l'origine du rajeunissement de la force de travail et nécessitent des investissements dans le capital humain. La population des adultes travailleurs de 30-49 ans travaille, donc elle produit, mais elle consomme son profit pour acheter une maison ou pour élever les enfants, sans économiser trop. La population adulte d'âge moyen gagne encore plus puisqu'elle profite de l'expérience accumulée et elle épargne plus que les 30-49 ans. La plupart des vieux sont en retraite et ils dépendent des autres, particulièrement en ce qui concerne la santé, mais aussi pour leur revenu, issu des transferts des actifs occupés. Cette étude a montré que le taux d'accroissement du PIB par habitant est fortement lié à la structure par âge. Utilisant des données quinquennales sur la période 1950-1990 des pays de l'OCDE, les auteurs ont trouvé une forte corrélation positive entre le poids de la population d'âge moyen (50-64 ans) dans la population totale et l'accroissement du PIB par tête de la période suivante. Ils ont trouvé aussi une corrélation négative entre la croissance économique et le poids de la population âgée.

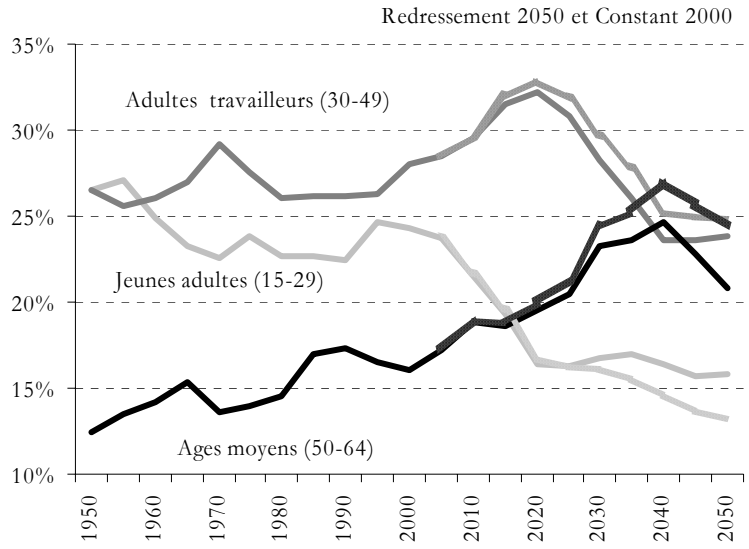
Pour la Roumanie, la transition de la structure par âges fonctionnels se présente comme l'indiquent les figures 6a et 6b.

Figure 6a
Évolution de la structure par âges fonctionnels (tous les groupes d'âges)




On voit clairement, sur la figure 6a la « fenêtre d'opportunité démographique », déterminée plus haut, ainsi que les accroissements structurels des proportions de la population âgée et de la population d'âge moyen, pendant presque toute la période considérée. Encore une fois se pose la question de savoir si c'est une période de bonus ou de malus. Les comportements économiques des groupes d'âges fonctionnels vont-ils ou non dans le même sens que celui des pays de l'OCDE ? Si oui, quelle est la relation la plus forte ? Celle potentiellement positive induite par l'accroissement structurel de la population d'âge moyen capable de forts investissements ? ou celle potentiellement négative induite par l'accroissement du poids de la population âgée, essentiellement consommatrice ?

Figure 6b
Évolution de la structure par âges fonctionnels
(groupes d'âges potentiellement actifs)




Au sein du groupe des âges adultes, il y a eu et il y aura des changements structurels (voir figure 6b). L'accroissement du poids des jeunes adultes peut fournir un bonus démographique par le biais du rajeunissement de la main-d'œuvre et de l'enrichissement du capital humain. L'accroissement du poids des adultes travailleurs profite au domaine de la fiscalité parce que cette frange de la population est la plus susceptible de travailler et donc de payer des impôts. L'accroissement de la part des adultes d'âge moyen peut fournir un bonus par le biais des investissements.

Pour la Roumanie, toute la période 1950-2050 est marquée par des changements de ces types. Le problème est qu'ils sont trop nombreux, se répétant plusieurs fois, avec des « va-et-vient » qui perturbent énormément la capacité de planifier les politiques publiques concernées. Ainsi on peut observer trois périodes de rajeunissement de la force de travail (1950-1955, 1975-1980 et 1995-2005), deux périodes d'accroissement de la population des adultes travailleurs (1965-1980 et, la plus longue, 2000-2030) et un accroissement presque continu (à l'exception des années 1970 et 2000) de la population d'âge moyen.

## 3. Conséquences de la transition de la structure par âge. Implications économiques et politiques

### *3.1. Le futur : nouvelles vagues, nouveaux équilibres*

Pour saisir les transformations possibles de longue durée, jetons un coup d'œil sur les histogrammes des âges en 2030 et en 2055 (figures 7 et 8). On peut y voir le passage des vagues déjà formées vers les âges supérieurs et la formation de nouvelles vagues résultant d'effets d'inertie.

Au terme de 30 ans d'évolution après le tournant du millénaire, on peut s'attendre à une nouvelle vague F (formée pendant la deuxième moitié des années 2000, environ), due principalement à l'effet d'inertie de la vague D. Cette vague sera moins importante si la fécondité reste au niveau de l'année 2000 ou si elle tombe encore au-dessous (en 2001, l'ICF a été de 1,27 enfant par femme!). Après un quart de siècle, durée égale à l'intervalle entre les générations roumaines, on peut se demander s'il y a ou pas une deuxième nouvelle vague. La réponse est plutôt oui dans le cas du scénario « Redressement 2050 », et certainement non dans le cas du scénario « Constant 2000 ». La formation d'une nouvelle vague ne peut être considérée, du point de vue économique, que comme un possible malus dans un premier temps, même si, avec le temps, quand la vague traversera les âges actifs, elle pourra devenir un facteur positif pour le développement.

L'équilibre entre les grands groupes d'âges sera changé, quelle que soit la variante de projection. Apparemment, en 2030, comme en 2002, on se trouvera dans une période de fenêtre démographique, car toutes les générations nombreuses sont et seront à l'âge de la maturité, donc potentiellement actives. Elles représentent 68 % de la population totale. Le bonus serait encore plus grand selon le scénario « Constant 2000 » parce que 70 % de la population totale serait en âge de travailler. Mais une première différence consiste dans le poids des jeunes et celui des vieux. En 2002, les jeunes représentaient 18 % de la population totale et les vieux 14 %. En 2030, l'équilibre sera inversé : 15 % de jeunes et 17 % de vieux. Ceci vaut pour la variante qui considère le redressement de la fécondité. Selon l'autre variante, la différence entre les poids respectifs des jeunes et des vieux est encore plus grande : 12 % de jeunes et 18 % de vieux. Une deuxième différence consiste dans la composition interne du groupe des âges adultes. En 2002, les généra-

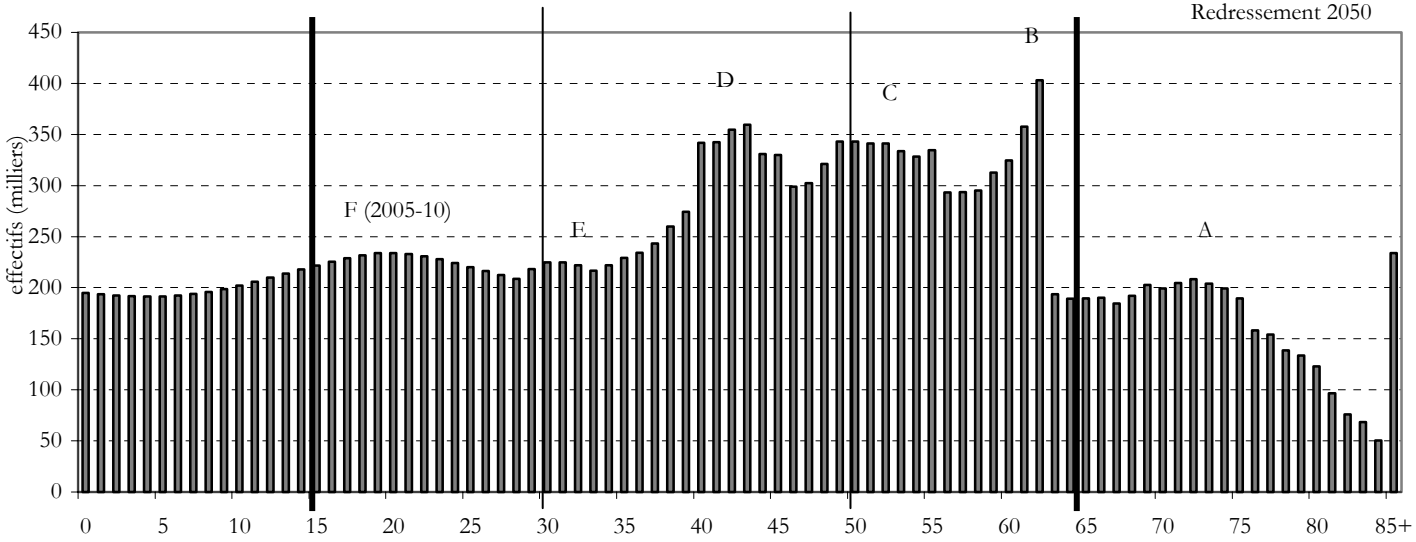
tions nombreuses sont plutôt dans la première partie de leur phase d'âge adulte, tandis qu'en 2030, elles approchent du troisième âge, restant pourtant toutes dans les groupes d'âges actifs. Économiquement, selon la théorie du cycle de vie, les années 2002 et 2030 peuvent bénéficier de bonus démographiques, mais différents en nature et en coûts sociaux, parce que, dans la première période, la formation du capital humain nécessite des investissements spécifiques aux jeunes adultes au commencement de leur vie active, tandis qu'en 2030 ce sera un bonus sans coûts (si la retraite avant l'âge légalement prévu n'est pas un phénomène de masse) puisque les nombreux adultes d'âge moyen (50-64 ans) auront moins de dépenses à faire et pourront investir et économiser.

Après un quart de siècle, en 2055, les générations nombreuses se trouveront toutes à l'âge de la vieillesse, c'est-à-dire après 65 ans. Mais ce malus démographique pour la population dans son ensemble est d'autant plus grand que le bonus antérieur était important : 30 % de personnes âgées selon la variante « Constant 2000 », contre seulement 25 % selon la variante « Redressement 2050 », se trouveront dans cette catégorie, si lourde de besoins budgétaires.

En ce qui concerne les problèmes plus proches, voyons la situation pour l'année 2015 (figure 9).

Il semble que ce soit une année très bénéfique du point de vue démographique. Les adultes sont relativement nombreux (presque 70 %), le poids des jeunes est en équilibre avec celui des vieux (chaque groupe pèse environ 15 % dans la population totale), les jeunes adultes sont plutôt mûrs, potentiellement déjà porteurs d'un capital humain élevé, et les adultes d'âge moyen sont nombreux. Le seul problème démographique pourrait consister dans la présence de nombreuses turbulences, impliquant la potentialité croissante de dysfonctionnements ponctuels des services et la crainte de gros changements dans le futur proche.

Figure 7
Effectifs (milliers) de population par âges en 2030, selon le scénario de projection



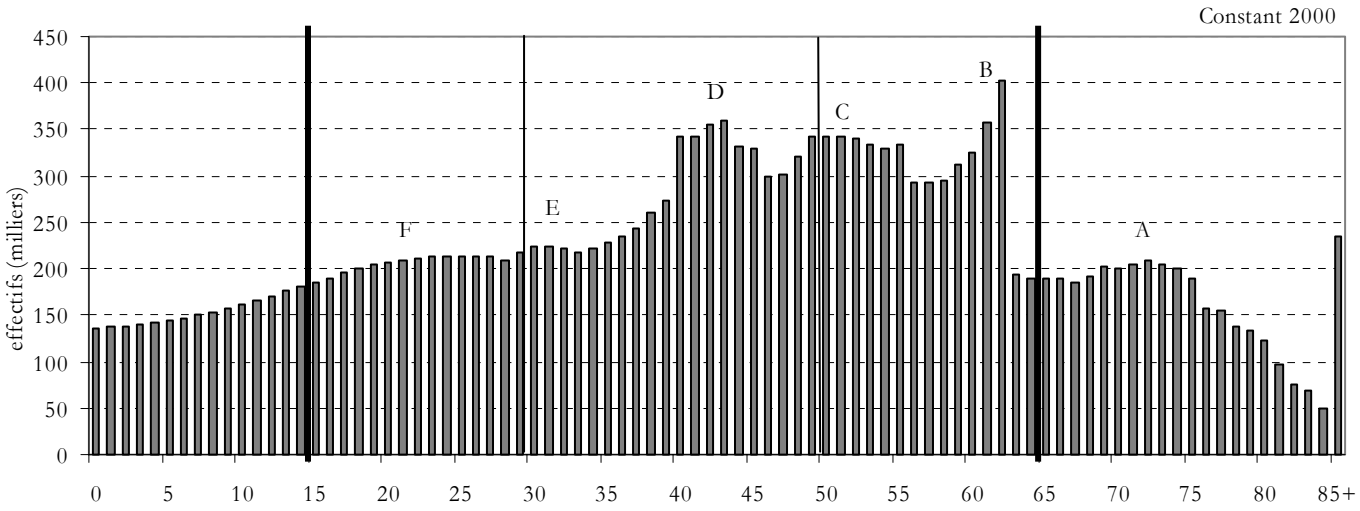
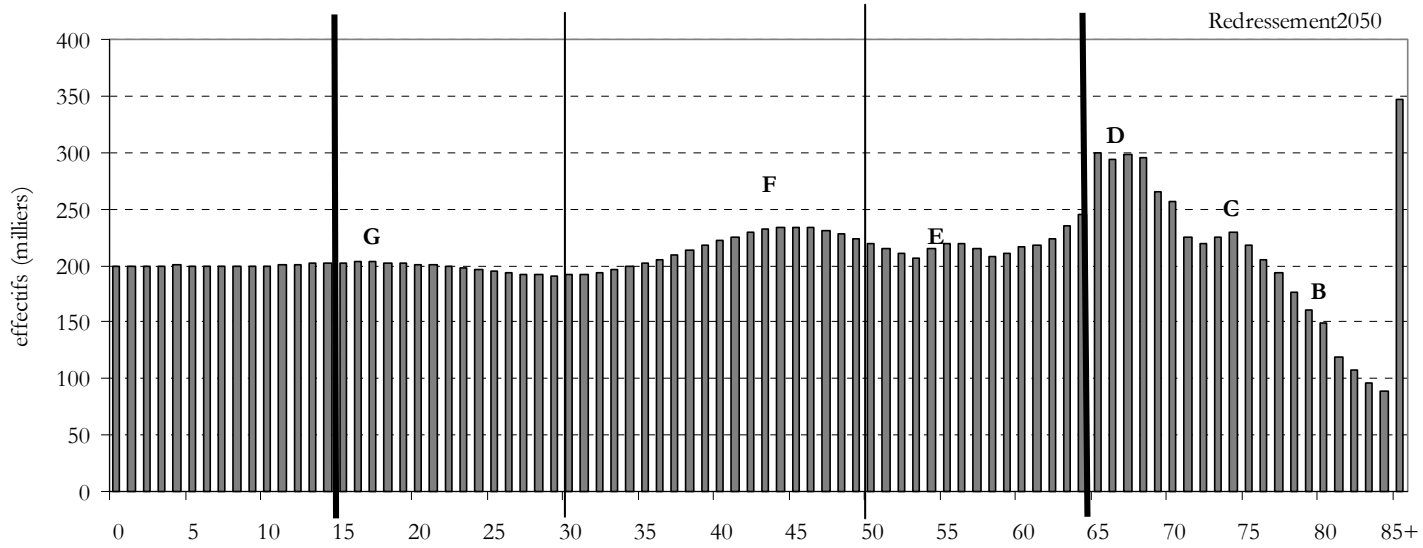
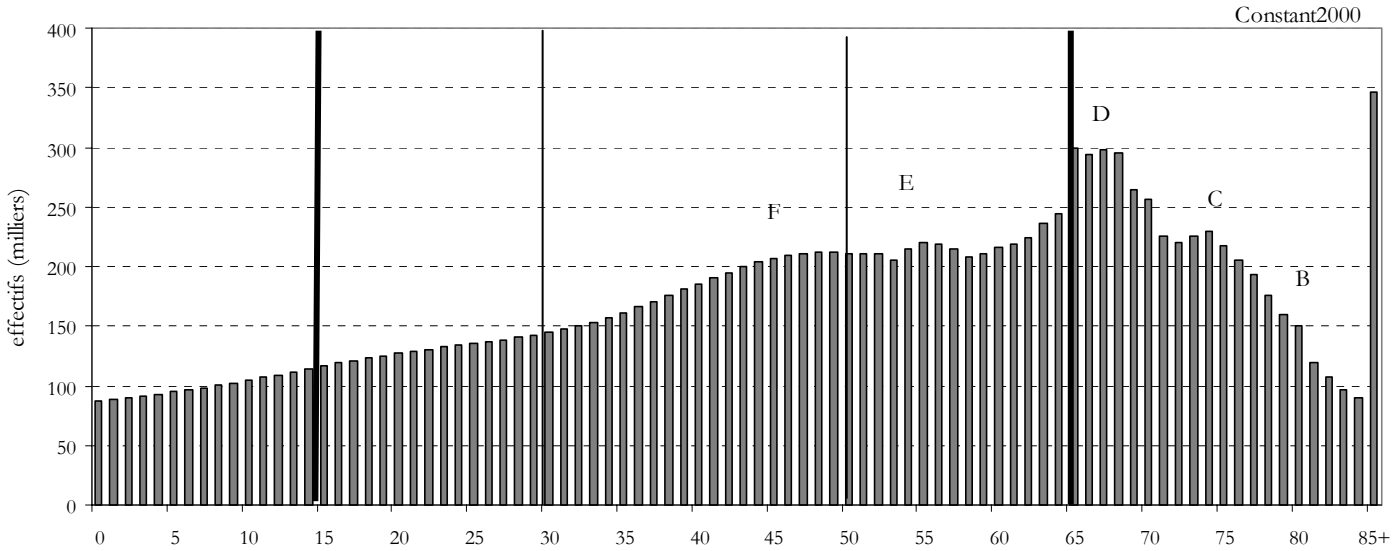

Constant 2000
effectifs (milliers)
450
400
350
300
250
200
150
100
50
0
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85+
F
E
D
C
B
A

Figure 8
Effectifs (milliers) de population par âges en 2055, selon le scénario de projection




Constant2000
effectifs (milliers)
400
350
300
250
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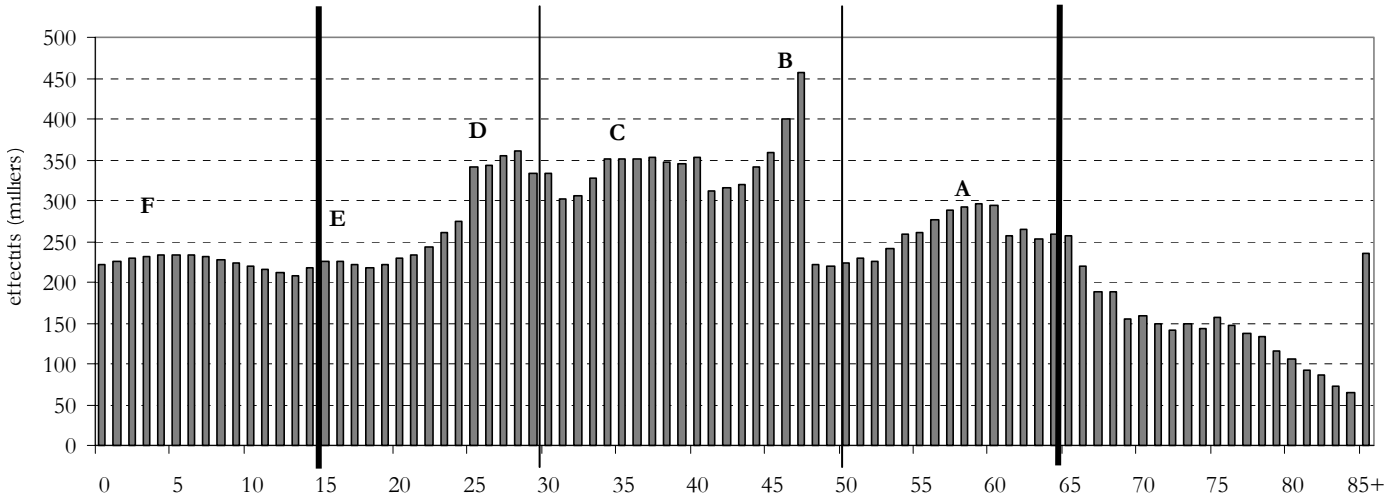
30
35
40
45
50
55
60
65
70
75
80
85+
F
E
D
C
B

Figure 9
Effectifs (milliers) de population par âges en 2015, selon le scénario « Redressement 2050 »



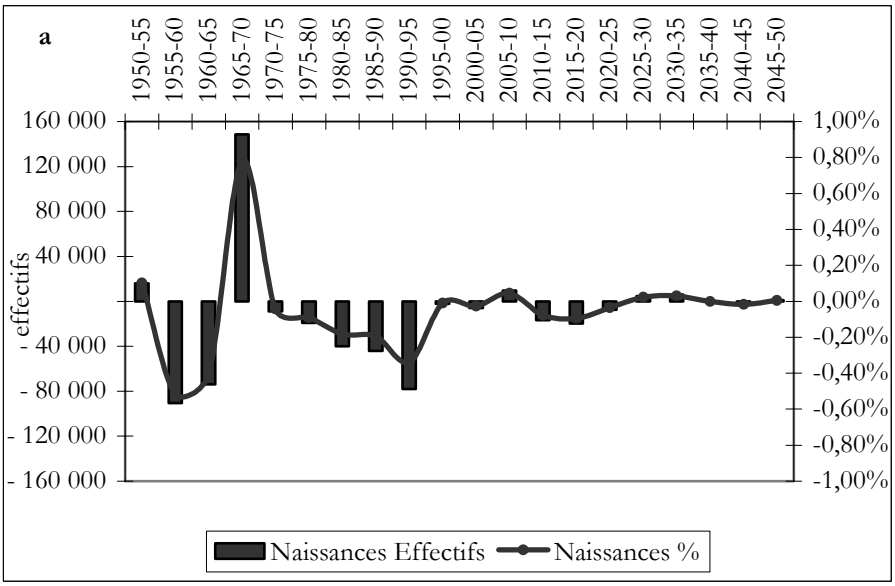
### *3.2. Turbulences passées et futures pour tous les groupes d'âges fonctionnels*

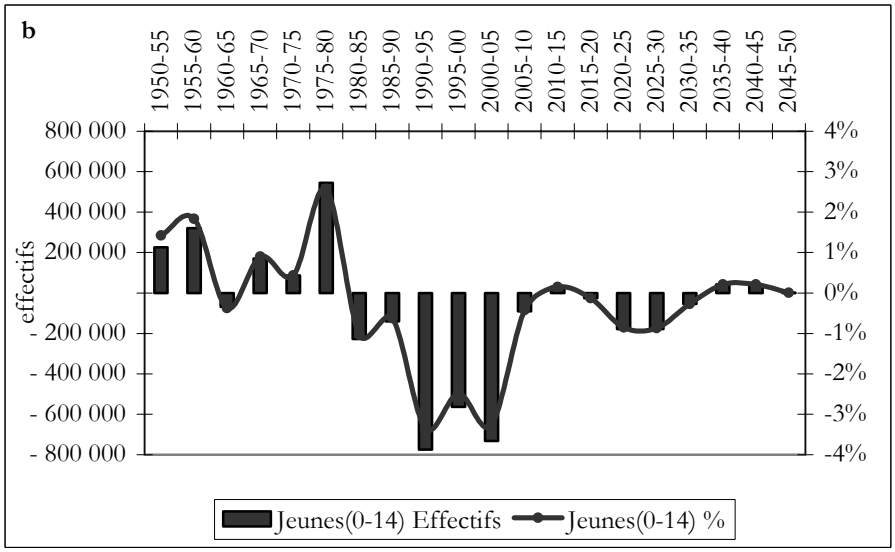
Les turbulences passées et leurs conséquences démographiques, les vagues et les turbulences futures, peuvent être suivies non seulement sur les pyramides des diverses années du calendrier, mais en les observant par groupes d'âges fonctionnels, évoluant sur une échelle temporelle quinquennale. La série des figures 10a-f présente les accroissements absolus et relatifs de diverses sous-populations : les nouveau-nés, les jeunes, les jeunes adultes, les adultes travailleurs, la population d'âge moyen et celle du troisième âge. Les changements de la période 2010-2015, d'importance exceptionnelle pour les Objectifs du Millénaire pour le Développement, sont mis en évidence par une couleur plus claire. Il est très facile d'observer les formes oscillatoires des accroissements et diminutions des effectifs. Cette série de graphiques utilise le seul scénario de projection « Redressement 2050 », mais, on le sait déjà, les turbulences ne disparaîtront selon aucune des autres variantes, même si leur amplitude peut diminuer.

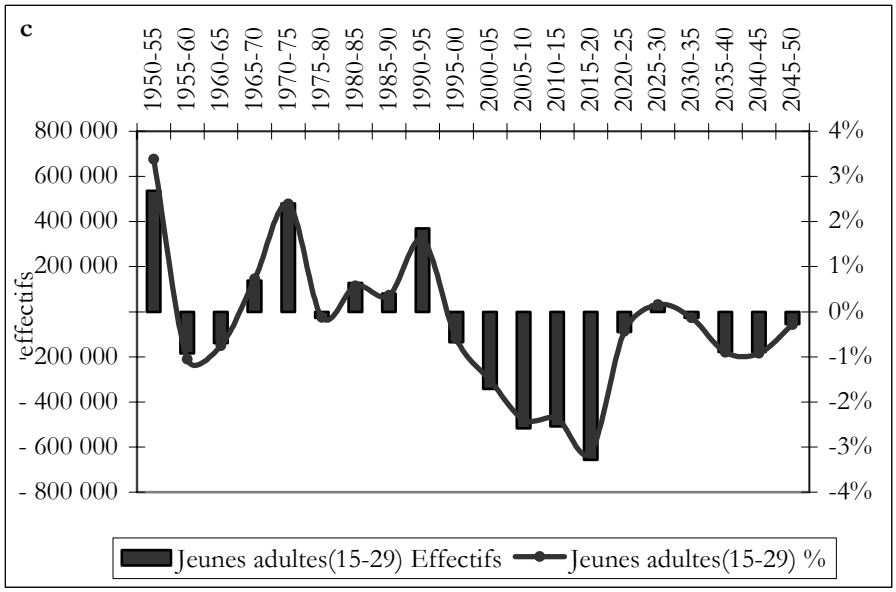
La population de la Roumanie continue de décliner (depuis 1990) tout au long de la période de projection, mais en plus de ceci, voyons quels sont les changements qui surviennent plus particulièrement à l'approche de l'année 2015. Entre 2010 et 2015 :

- le nombre de naissances recommencera à décliner, de plus de 230 000 à environ 220 000 (figure 10a) ;
- le déclin numérique massif des jeunes (0-14 ans) sera temporairement arrêté, avant une reprise en 2020 (figure 10b) ;
- le nombre des jeunes adultes (15-29 ans) poursuivra son déclin massif, avec encore un demi-million d'individus, représentant 2,4 % de la population totale (figure 10c) ;
- les effectifs des adultes travailleurs augmenteront à 350 000 (1,7 % de la population totale), mouvement situé entre deux périodes de diminution de leur nombre, 2000-2005 et 2020-2040 (figure 10d) ;
- le nombre des adultes d'âge moyen (50-64 ans) souffrira un déclin temporaire, après avoir augmenté entre 2005 et 2010, et avant une autre période d'augmentation entre 2015 et 2030 (figure 10e) ;
- les effectifs des personnes âgées s'accroîtront à un rythme plus ou moins accéléré, avec une stagnation vers l'an 2015 (figure 10f).

Figure 10a-f
Accroissements d'effectifs et impact des flux de cohortes
sur les groupes d'âges fonctionnels
en pourcentage de la population totale au début de la période quinquennale

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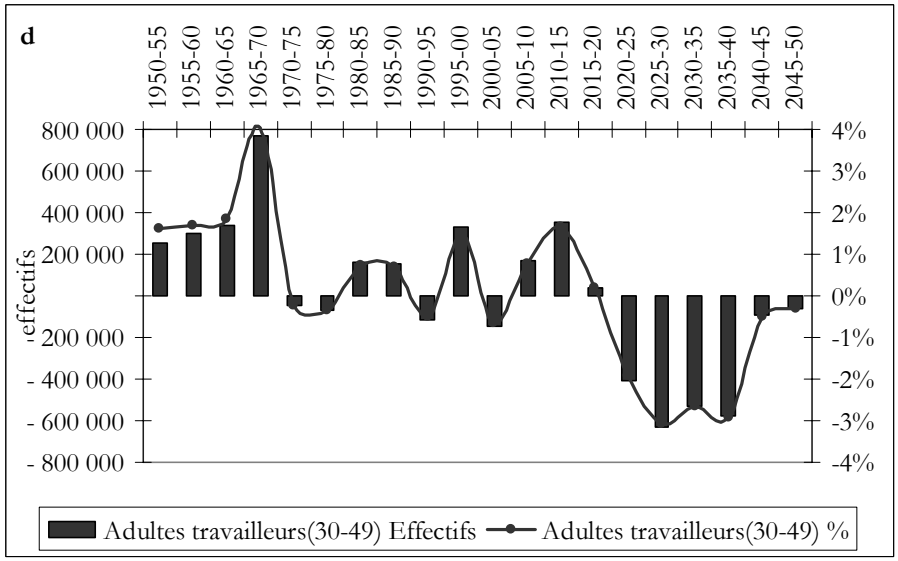
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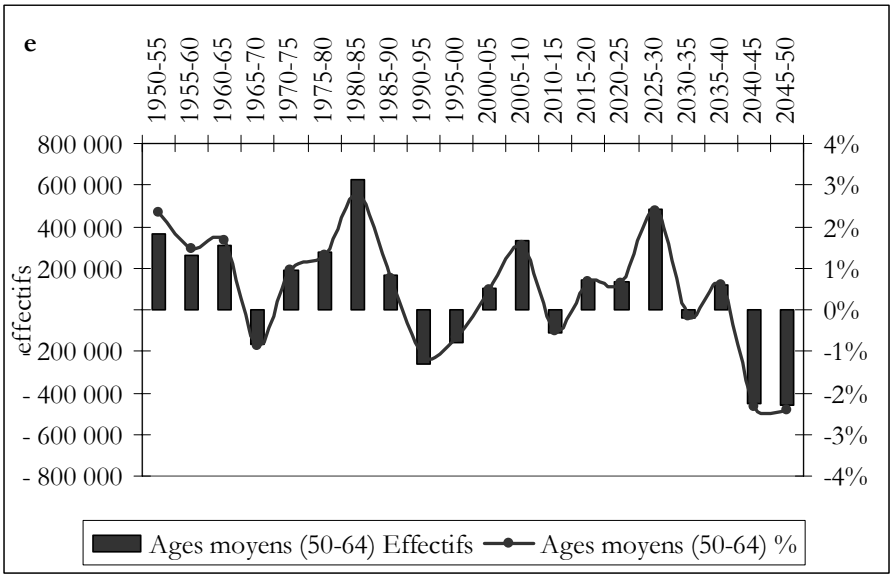
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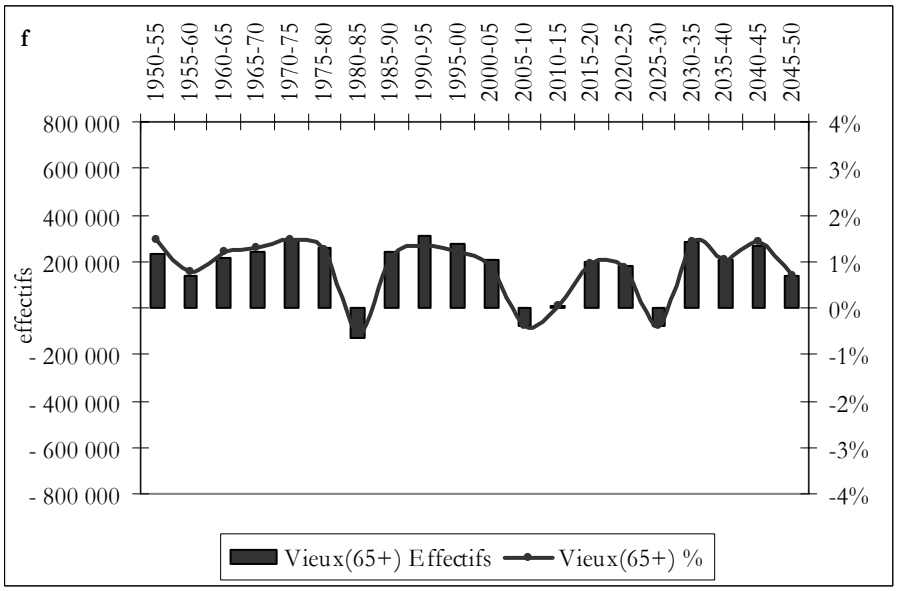
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### *3.3. Relations entre l'évolution des effectifs des groupes d'âges fonctionnels et le développement économique, 1960-2000*

À la fin de ce chapitre, nous allons présenter les résultats d'une analyse statistique destinée à tester les relations entre la population et le développement. Nous avons utilisé la série annuelle des structures en pourcentages par groupes d'âges fonctionnels entre 1960 et 2000 (Institut National de Statistique) et la série correspondante de données sur le développement économique (Heston *et al.*, 2002). Les variables économiques utilisées sont le produit intérieur brut par habitant et ses composantes : les parts de la consommation, de la dépense publique de consommation et de l'investissement.

L'analyse des indicateurs macro-économiques montre que la période 1960-2000 a été une période de bonus économique (accroissement continu du PIB). L'évolution du principal indicateur du développement montre que la période la plus bénéfique pour l'économie a été celle d'avant 1985, quand le taux d'accroissement se situait entre 8 et 16 % (tableau 1). Cette période coïncide avec la période d'accroissement de la population, tandis que la période de déclin démographique (après 1990) coïncide avec un ralentissement de l'accroissement du PIB (seulement 1 % annuellement) et, bien sûr, avec la période de transition d'une économie socialiste totalement planifiée vers une économie de marché. Si nous considérons les composantes du développement, l'évolution de la consommation nous montre que sa part a diminué jusqu'à la veille des années 1980 et a repris une tendance ascensionnelle par la suite, tandis que le rythme d'accroissement de la dépense publique de consommation a eu une évolution contraire. La période la plus propice pour l'investissement semble être la dernière, 1990-2000, marquée par une forte baisse de la fécondité.

Cette analyse macro-économique grossière ne nous dit rien sur l'influence de la structure par âge et sa transition. Sans avoir la prétention d'une analyse très adéquate, jetons un coup d'œil sur les corrélations statistiques (tableau 2). Contrairement aux résultats trouvés par Lindh et Malmberg (1999), le développement économique n'est pas associé positivement avec la part de la population d'âge moyen au début de la période, mais très négativement (-0,701), comme d'ailleurs la part des personnes âgées (-0,432). Les deux valeurs sont statistiquement significatives au niveau de confiance $p<0,01$, mais la dernière association est assez faible. Deux autres associations paradoxales, signi-

Tableau 1
Évolution annuelle des indicateurs économiques, 1960-2000

| Période | Taux annuel d'accroissement du PIB par habitant (%) | Pourcentage annuel moyen de consommation | Pourcentage annuel moyen de dépense publique de consommation | Pourcentage annuel moyen d'investissement |
|---|---|---|---|---|
| 1960-1965 | 9 | 65 | 29 | 7 |
| 1965-1970 | 11 | 59 | 33 | 9 |
| 1970-1975 | 16 | 57 | 35 | 9 |
| 1975-1980 | 12 | 56 | 38 | 8 |
| 1980-1985 | 8 | 59 | 30 | 9 |
| 1985-1990 | 3 | 65 | 22 | 8 |
| 1990-1995 | 1 | 74 | 17 | 14 |
| 1995-2000 | 1 | 82 | 11 | 14 |

Tableau 2
Coefficients de corrélation et de régression de la structure par âges fonctionnels avec les taux d'accroissement annuels du PIB

| Déterminants de l'accroissement économique | Coefficients de corrélation de Pearson (avec l'accroissement du PIB) | Coefficients de régression standardisés (variable dépendante : l'accroissement du PIB) |
|---|---|---|
| Jeunes 0-14 | 0,461 ** | pas incluse |
| Jeunes adultes 15-29 | - 0,052 | 0,189 |
| Adultes travailleurs 30-49 | 0,456 ** | - 0,061 |
| Âges moyens 50-64 | - 0,701 ** | - 0,671 * |
| Vieux 65+ | - 0,432 ** | - 0,256 |
| Consommation (%) | -0,629 ** | -1,205 ** |
| Dépense publique (%) | -0,387** | 0,324 |
| Investissement (%) | 0,638 ** | - 0,809 |

** $p<0,01$; * $p<0,05$. $R^2 = 0,660$.

ficatives statistiquement mais pas très fortes, sont celles de la part des jeunes (0-14 ans) et de la part des adultes travailleurs (30-49 ans). Selon la théorie du cycle de vie, ceux-ci sont plutôt des consommateurs et pas des investisseurs, et donc ils ne devraient pas favoriser le développement économique. Les corrélations qui montrent le contraire sont

faibles. C'est pourquoi nous avons mené une autre analyse statistique qui tient compte simultanément de tous les facteurs, et nous avons ajouté comme variables de contrôle les parts en pourcentages des composantes du PIB.

Les nouveaux coefficients obtenus montrent que, toutes autres choses étant égales, le seul pourcentage qui compte est la part de la population de 50-64 ans. Mais l'orientation négative subsiste (-0,671). Au lieu que son poids contribue au développement économique, il l'a freiné. C'est la part de la consommation dans le PIB qui a compté le plus dans le développement économique (-1,205, significatif au seuil de $p<0,01$). Les autres groupes d'âges n'ont plus de contribution significative dans la régression par rapport à l'accroissement économique. La seule explication que nous trouvons pour cette situation est que l'économie roumaine est plutôt une économie de consommation, et tous les autres moteurs possibles sont encore trop faibles dans la période de transition actuelle. Ou peut-être les nombreuses disparités des effectifs des divers âges, en haut et en bas, et leurs irrégularités – c'est-à-dire les turbulences – ont-elles empêché l'économie de se développer régulièrement ou en concordance avec la théorie ?

**Références bibliographiques**

CASELLI, G., VALLIN J., et WUNSCH G. (2001) *Démographie : analyse et synthèse. Vol I : La dynamique des populations*, INED, Paris.

CHESNAIS, J.-C. (1987) *La transition démographique. Étapes, formes, implications économiques*, Presses Universitaires de France, INED, Paris.

COUNCIL OF EUROPE (2001) *Recent Demographic Developments in Europe 2001*, Council of Europe publication, Strasbourg.

GHETAU, V. (1997) « Evolutia fertilitatii in Romania. De la transversal la longitudinal », *Bibliotheca Demographica*, n° 5, Centre de Recherches Démographiques de l'Académie Roumaine, Bucarest.

GHETAU, V. (2001) « Populatia Romaniei la sfarsit de secol si mileniu. Ce perspective? (II - rezultate detaliate) », *Populatie & Societate*, n° 2-3, Centre de Recherches Demographiques de l'Académie Roumaine, Bucarest.

HESTON, Alan, SUMMERS, Robert, et ATEN, Bettina (2002) *Penn World Table Version 6.1*, Center for International Comparisons at the University of Pennsylvania (CICUP), http://pwt.econ.upenn.edu/ (consulté le 1er février 2004).

INSTITUT NATIONAL DE STATISTIQUE (2001), *Romanian Demographic Yearbook 2001*, Bucarest.

LINDH, T., et MALMBERG, B. (1999) « Age Structure Effects and Growth in the OECD, 1950-1990 », *Journal of Population Economics*, 12: 431-449.

MURESAN, C. (1996) « L'évolution démographique en Roumanie : Tendances passées (1948-1994) et perspectives d'avenir (1995-2030) », *Population*, 4-5: 813-845.

MURESAN, C. (1999a) *Evolutia demografica a României. Tendinte vechi, schimbari recente, perspective (1870-2030)*, Presa Universitara Clujeana.

MURESAN, C. (1999b) « The decrease of life-expectancy at birth in Romania and some crisis contributing factors », *Health & Place*, 5(2): 187-192.

NAVANEETHAM, K. (2002) *Age Structural Transition and Economic Growth: Evidences from South and South-East Asia*, Asia Meta Centre Research Paper Series, no. 7, http://www.cds.edu/download_files/337.pdf (consulté le 1er février 2004).

POOL, I. (2000) « Vers un modèle de la 'transition âge-structurelle' : une conséquence, mais aussi une composante de la transition démographique », contribution à la *Conférence de l'Association canadienne-française pour l'avancement des science*, Montréal, mai 2000.

US BUREAU OF THE CENSUS, *International Data Base, China*, http://www.census.gov/ipc/ (consulté le 1er février 2004).

# 11

# AGE-STRUCTURAL TRANSITIONS: MAJOR POLICY IMPLICATIONS FOR CHINA

**YAN Hao**[1]

***Abstract***

China is the most populous country in the world. In less than 50 years since 1950, the Chinese population has experienced a process of demographic transition with fertility falling quickly from high to low levels. In between, sizeable bulges and troughs in age structure were left as a result of China's turbulent course of social and economic development over recent decades. The government-sponsored birth control programmes are believed to have played a special role in pressing down fertility since the mid 1970s. Projections of the age-structural transition show that a "window of opportunity" for China as a whole will arrive in around 2010, when the share of working-age population will reach the highest level of 71% and the total dependency ratio will drop to 42%. However, marked differences exist between provinces and between urban and rural areas. Before the dependency ratio starts to pick up again around 2015, China will still have had over 10 years' time to make full use of this "demographic bonus". It is a crucial period for China to reach its target of 2020 aiming to quadruple its per capita GDP over that of 2000, and to fulfill its commitment to the Millennium Development Goals. Major policy implications are discussed here relating to labour market and social security programs.

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## 1. Age-Structural Transitions: Trends and Phases

Age-structural transitions usually refer to the gradual process of a "young" population moving to an "aged" one as a result of changes in age structure over time. In a relatively closed population where emigration and immigration are relatively small, age structure is shaped largely by the changes in fertility and mortality. In modern times, according to the classical theory of demographic transition, both the mortality and fertility of a population will decline from high to low levels in the course of modernization. The population starts to age as the proportion of children falls and that of the elderly rises.

Cowgill and Holmes (1970) proposed that populations should be considered as "young" when the proportion of the population aged 65 and over remains under 5%, and should be considered "aged" when the proportion of the elderly reaches 10%. It is believed that 65 is an age when a large segment of the population has significant physical, economic and social needs. However, a document of the 1982 World Assembly on Ageing suggests that it is practical to take 60 years and over as the criterion of the elderly in developing countries, where elderly mortality is still high (UN, 1994). In China, for example, the cut-off age for the elderly is set at 60 in most official publications.

It is believed that almost every country in the world is moving from a "younger" population to an "older" one in the era of modernization and globalization. However, countries may find themselves not only at different stages of modernization, but also at different stages of age-structural transitions. By using a range of countries, Pool (2005) outlined a possible framework that saw age-structural transitions as passing through different phases, as in the demographic transition model.

- Phase 1: The *Phase of Simple Momentum*, most typically of accelerating momentum, where into the foreseeable future larger and larger birth cohorts will work their way across the age structure.
- Phase 2: The *Phase of Population Waves*, at which stage most countries of the World are found today. It is generated by a shift from accelerating to decelerating momentum, and that may take the form of one simple wave, or followed by a second and subsequent oscillations.
- Phase 3: The *Phase of Ageing* when there may still be growth from momentum, or stationarity, or negative natural increase, and also oscillations.

Some developed countries have entered Phase 3, where demographic transition is almost completed at very low levels of fertility and mortality. Most developing countries, on the other hand, are still in Phase 1 or Phase 2, because fertility in these countries started to decline only recently. Nevertheless, projections indicate that age-structural transitions will proceed in the future much more rapidly in developing countries than it did in developed ones.

The demographic transition theory makes its unique contribution by indicating the general trend and direction of fertility and mortality changes in the course of modernization. However, a general trend of decline in fertility and mortality does not necessarily rule out short-term fluctuations that may influence the age-structural transition of a population for decades. In fact, most countries, developed and developing alike, have in this century experienced, to various extents, fluctuations in fertility and mortality rather than smooth growth or decline. Such fluctuations produced disordered cohort flows, that leave more people in some cohorts or fewer in others, have not only direct impact on population age structure, but also far-reaching policy implications that governments and the society have to deal with seriously.

## 2. Age-Structural Transitions as Shown in China's Population Pyramids

Figure 1 gives China's population pyramid of 2000 based on one-year age group data drawn from of the 5th National Census. At first glance one can easily detect three apparent bulges separated by two troughs and one contracting base. These bulges and troughs have greatly shaped China's population age structure to date, and are going to influence the population's age-structural transitions in the future. The description of these perturbations that follows here is presented largely in terms of numbers rather than rates.

As is shown in Figure 1, the age structure of the population 60 and over shows a rough equilateral triangle, a typical shape for a population following stable growth patterns. It reflects a situation for the years before 1940, when population growth was relatively smooth, with each cohort followed successively by a larger one. The triangle does not give any obvious hints of fluctuations in births and deaths alike, no matter how the actual rates were at that time. Of course, the top shrinks quickly as the elderly start to die out.

Figure 1
Population pyramid by one-year age group, China, 2000


Source: Constructed from the 5th National Census data (SSB 2002).

The age structure of the population 55-59 looks typical for a population under static growth. It reflects a situation, in the period 1941-1945, where population growth more or less stagnated, with each cohort followed only by a barely larger one. Obviously, this slow growth has little to do with the effect of modernization proposed by the demographic transition theory. In fact, it can only be attributed to the chaos and social turbulence during the Anti-Japanese War period when excessive deaths were caused.

As the age structure of the population aged 45-54 (a broad based triangle) shows, growth began to pick up after 1946, with each older cohort being outnumbered by a younger one. The broad base indicates that the growth accelerated quickly during the 1950s, a period when China made great progress in economic development after the founding of the People's Republic in 1949. Chinese demographers usually call this the first demographic bulge, and consider the people born during the period 1950-1958 as the first wave of China's baby boom generation.

The sudden trough of the age groups 38-41 reflects the severe impact of the 1959-1962 famine on China's population growth. From 1958 to 1961, for example, the TFR dropped from 5.5 to 3.3 and the number of surviving births from 12.9 million to 7.3 million. Since the pyramid only reflects the age structure of the survivors, its shape has also been affected by the abnormally high death rate during the famine period, particularly among infants and children.

As the country recovered from the famine, another baby boom wave took place starting about 1963, as it is seen from the bulge in the age groups 25-38. Compared with the first wave, the second wave of the baby boom not only lasted longer, but also resulted in the largest birth cohorts in China's history. On average, the annual total births reached 25 million during the period 1963-1975. It is interesting to notice that the second wave of the baby boom forms a shape that looks almost opposite to the first one: the former has a narrower top and broader base and the latter a broader top and a narrower base. The narrower base indicates that the number of births started to decline in the early 1970s when family planning programs were introduced gradually.

The second trough can be observed at age groups 15-24, encompassing the people born during the period 1976-1985 when the controversial One-Child policy was implemented. It is estimated that women in each year during this period gave 5 million fewer new births than in the period 1966-1974.

Looking at age groups 10-14 we see another bulge that took shape from 1985, and which is named by some Chinese demographers the third wave of the baby boom. Two factors are believed to have played a role. The first is a policy factor, as the One-Child policy was not implemented as forcefully as in the early 1980s, particularly in rural areas. The second is the "echo factor" or the secondary momentum effect, when baby boomers started entering childbearing ages. Even in times of low fertility, a large parental cohort is likely to produce a large child cohort. However, it seems that the "echo" did not take place at a replacement level, since the third wave looks much smaller than the second one.

The pyramid starts to shrink at childhood, at age group 10 and below, because the smaller parental cohorts born during the climax years of the One-Child policy began to have their own children. It is interesting to note that the number of children born to them is smaller than that of their parents, indicating that the parental cohorts might

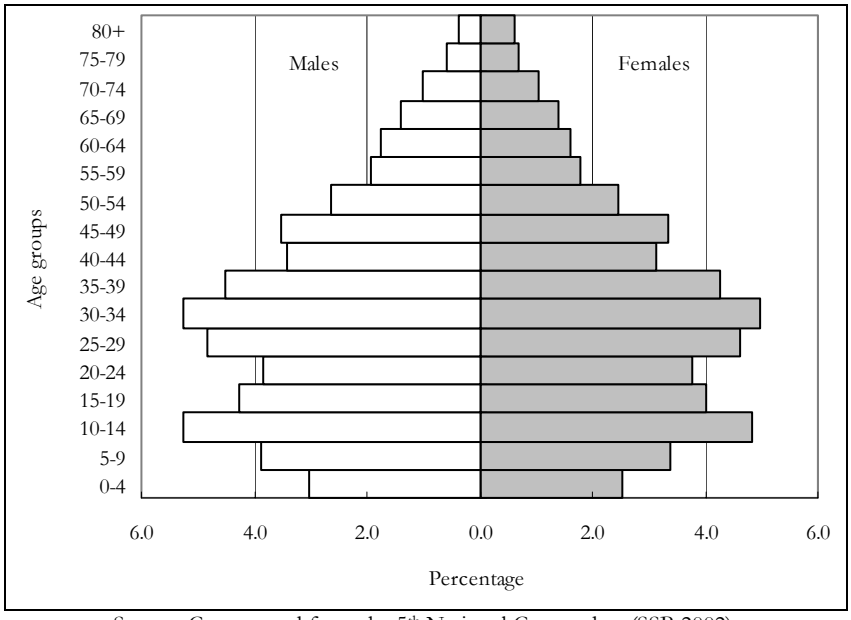
have had a below-replacement level of fertility as well. What we know is that many places allow only-children couples to have two children. An educated guess is that a modernization factor might have started to take effect, since the 1990s is the period when China experienced rapid economic growth and marked improvement of people's living standard. Another point worth noticing during this period is the rising sex ratio among new births, from 1.09 for the group 10-14 to 1.15 for the group 5-9 and further to 1.20 for the group 0-4. The imbalance between boys and girls may have as important policy implications as the age structural transitions in the future.

In the next 5-10 years, it can be predicted that there will be another rise in the number of new births, when the third wave of baby boomers enters child-bearing ages. It is uncertain, however, if the below-replacement fertility can be kept, since many local governments are considering possible changes in their birth-control maintained policies to allow only-children couples to have two children. Even at the replacement level, we can still be sure that the percentage of children under 14 will continue to decline and that the proportions at older ages will go up, leading to a gradual ageing of the population as a whole.

While discussing the impact of fertility fluctuations, because of age-reporting errors, caution should be taken to choose a form of population pyramid that smoothes these out. Figure 2 gives China's population pyramid by five-year age group, thus dampening possible errors. But even here the impact of successive baby booms over the last few decades can still be clearly observed. However, in comparison with the pyramid by one-year age group in Figure 1, the first trough, or the impact of the famine-induced fertility decline during the period 1959-1962, almost disappears from Figure 2. The reason lies in the fact that people born during the famine have been clustered into separate five-year age groups along with larger neighboring cohorts. Comparisons between census data should be taken with additional care, because China's four previous censuses were conducted not every five or ten years, but in 1953, 1964, 1982 and 1990, separately. If five-year age groups are preferred in analyses, birth cohorts of a specific year cannot be grouped with neighboring cohorts consistently in the same five-year group from one census to another. Therefore, the changes in pyramid shapes between censuses do not necessarily represent the changes in a specific five-year cohort over time. To minimize such inconsistencies in comparing census data, the Chinese government has decided to

conduct an interim census every five years and a full census every ten years from 1990 when the 4th National Census was completed. A 1% population census was carried out in 1995 and the 5th National Census was conducted in 2000.

Figure 2
Population pyramid by five-year age group, China, 2000




Source: Constructed from the 5th National Census data (SSB 2002).

## 3. The Baby Boom as a Result of Rising Fertility and Falling Mortality

The three baby boom waves have played a major role in shaping age-structural transitions in China. Baby booms can be attributed to two major factors: a large number of women in childbearing ages or an extraordinarily high level of fertility, or a combination of the two. It is believed that high fertility, not large numbers of women, has been the crucial determinant of baby booms in China. However, unlike the case in many industrialized countries after the World War II where the infant mortality rate remained consistently low during the pre-baby

boom and the baby boom period, the baby boom in China can also be attributed to a third factor: falling mortality. Anyway, the discussion here concerns primarily the number of people who have survived, instead of the number of births. In fact, China's baby boom provides a lively illustration of the demographic transition theory.

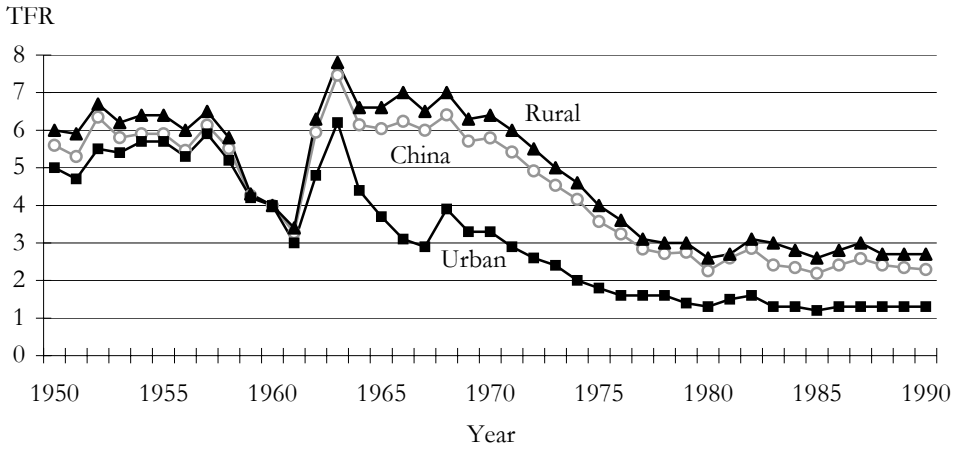
Before the onset of the baby boom in the early 1950s, China remained in a typical pre-transition regime with high fertility, high mortality and low levels of natural increase. Based on the 1982 National Fertility Survey data, total fertility rates were estimated at 5.2 on average in the 1940s. Since mortality was also high at that time, with crude death rates ranging from 25 to 30 per thousand, the real rate of increase was quite low. As mentioned in the previous section, China's population size almost stagnated in the early 1940s.

The founding of the People's Republic in 1949 opened a new chapter in China's modern history. As the national economy recovered quickly from war and famine, people's living standards also improved substantially. The demographic transition theory argues that mortality starts to fall as a society becomes increasingly modernized while fertility is kept continuously at a high level. In less than eight years from 1949 to 1957, China's mortality rate dropped from 20 to 10.8 per thousand (Wang, 1985). The infant mortality rate (IMR) dropped during the same period from about 200 to 70 per thousand. As a result, people's life expectancy rose sharply from 34 to 60. It is widely believed that the fast mortality decline, and the decline of IMR in particular, in the early 1950s made a special contribution to population growth during this period. For example, the TFR increased by about 10% from the average of 5.2 in the 1940s to 5.7 in the 1950s. During the same period, however, the number of survivors increased by one third from 113 million to 170 million, yet no substantial rise in the number of women at childbearing ages was observed. In this context, the baby boom in the early 1950s can also be described as a survivor boom.

Figure 3 shows the changes in fertility in China during the period 1950-1990. If taking a TFR at 5 as an indicator of high fertility, there have been two periods when fertility was high. The first lasted from 1950 to 1958 with an average TFR of 5.7, representing the first wave of baby boom, and the second lasted from 1963 to 1972 with an average TFR of 6.0, representing the second wave of baby boom. However, for the two population waves, the causes of fertility decline are quite different. The former wave was interrupted almost suddenly by a

famine, while the latter one was pressed down gradually by the government's birth control campaigns. After the famine, we see a quick rebound of fertility to a peak level. In the case of the latter wave, we see no trace of a possible return of high fertility. This might indicate that the era of high fertility has come to an end once and for all in China's history. Indeed, Figure 3 does not give any hint of the third wave of the baby boom as observed in population pyramids. This implies that the third wave of baby boom is not a direct product of high fertility, but largely an echo to the first two baby booms.

Figure 3
Changes in fertility, China, urban and rural, 1950-1990




Source: Reconstructed from Fan (1995).

The changes in TFR after 1990 are not shown in Figure 3, since official data are not available. The State Statistics Bureau (SSB) and the China Population Information and Research Centre (CPIRC) have come up with a number of TFR estimates in recent years. However, none of them have been published in official documents. The only official estimate we have so far for the 1990s is that of 1999 at 1.22, calculated from the 5th National Census data of 2000. However, this estimate is not taken very seriously by many demographers for being

unrealistically too low. An educated guess would be that a near replacement level fertility must not be far from the reality.[2]

## 4. Age-Structural Changes and the "Window of Opportunity" in China

A discussion on the age-structural transition in China is not possible without mentioning the baby boom generation for two obvious reasons: one is the absolute number of people involved (520 million, or nearly half of the total population in 1990), and the other is the accelerated momentum for the transition because of baby boomers' presence. Table 1 shows the changes in population age structure, based on census data from 1953-2000.

Table 1
Age distribution by census year 1953-2000, China

| Year | Total population (million) | Age group (%) | | | Total dependency ratio (%) |
|---|---|---|---|---|---|
| | | 0-14 | 15-64 | 65+ | |
| 1953 | 587.9 | 36.3 | 59.3 | 4.4 | 68.6 |
| 1964 | 705.0 | 40.7 | 55.8 | 3.5 | 79.2 |
| 1982 | 1,016.5 | 33.6 | 61.5 | 4.9 | 62.6 |
| 1990 | 1,143.3 | 27.7 | 66.7 | 5.6 | 49.9 |
| 2000 | 1,267.0 | 25.4 | 67.7 | 6.9 | 47.7 |

Source: CPIRC (2004).

When the first national census was conducted in 1953, China had a total population of 587.9 million. Although population increase had stagnated in the 1940s, as discussed previously, the population at the time can still be considered a "young" one, given the large share of children 0-14 at 36.3% and the small share of the elderly aged 65 and above at 4.4%, which is below the 5% mark suggested by Cowgill and

2. In a recent publication of the Population Centre of the Chinese Academy of Social Sciences (CASS), a number of TFR estimates were made for the period 1990-2001. They are presented here in Appendix Table 1.

Holmes. The ageing index of 12.1% can also serve as a benchmark for the structural changes in later years. The effect of the baby boom starting from 1950 can already be felt, given the fact that 43.4% of the surviving children were born during the five years prior to the census. The large share of the young people also keeps the total dependency ratio at a high level of 68.6%.

From 1953 to 1964 when the second national census was conducted, China's total population grew by 16.7% from 587.9 million to 705.0 million. During the same period, the number of children increased more rapidly by 26.7% from 205.8 million to 280.7 million, pushing its share in the total population from 36.3% up to 40.7%. These children were born entirely during the baby boom period since the 1950s. Although the elderly aged 65 and over did not vary much in numbers, remaining about 25 million, they had their share in the total population squeezed by baby boomers from 4.4% to 3.5%. The trend can be confirmed also by the ageing index falling to the lowest level of 8.6% and the total dependency ratio reaching a peak of 79.2%. This can be seen as a unique stage of age-structural transition in China where the population as a whole became "juvenized" rather than aged.

After the second national census, the census routine in China was interrupted by the chaotic Cultural Revolution (1966-1975), causing an 18-year interval before the third national census was conducted in 1982. While the total population increased by 30.3% from 705.0 million to 1,016.5 million from 1964 to 1982, the number of children grew by only 16.8%. This indicates that the massive family planning programmes introduced since the early 1970s had started to take effect. During this period, the majority of baby boomers born in the 1950s and the 1960s entered working ages, resulting in a marked increase in the population aged 15-64 and a fall in the dependency ratio. While population growth was still dominated by the increase in the number of young people, there were also indications that the elderly were catching up in number and proportion. During this period the total size of the elderly population doubled from 24.3 to 49.4 million, and their proportion rose from 3.5% to 4.9%. As a result, the ageing index rose from 8.6 to 14.6%.

When the 4th National Census was conducted in 1990, China's population stood at 1,143.3 million, an 11.1% increase from 1982. For the first time in history, China witnessed a decline in the number of children, due to the continuous fertility decline. To a certain extent, the

smaller number of births can also be attributed to late marriage and late childbearing, part of the government's birth control package. During the same period, the size of the working-age population rose by 18.2%, at a rate higher than that of the total population. With the proportion of the elderly exceeding the 5% mark and the ageing index going up to 20.1%, China's population as a whole could no longer be considered as "young".

The 5th National Census was conducted in 2000, resulting in a total population of 1,267 million. Compared with 1990, although the total number kept growing, the annual growth rate dropped by 0.3 percentage points from 1.38% to 1.08%. While the 0-14 age group share declined by 2.3 percentage points to 25.4%, that of the 65+ group rose by 1.3 percentage points to 6.9%, almost reaching the 7% mark for an "aged" population. At the same time, we see a slight rise in the number of people at working ages 15-64 from 66.7% to 67.7%, resulting in a further drop in the total dependency ratio to 47.7%.

Data from the previous five censuses show that China's population is gradually moving from a young population to the early stages of an adult population. As discussed above, the drastic course the demographic transition took over the last few decades has greatly shaped the current population age structure. But it is also clear that the process of demographic transition in China is far from complete. Even if fertility can be controlled at a low level in future through the joint effects of government intervention and socioeconomic development, the total population will still keep growing. The drastic fluctuations caused by the baby boom will also keep repeating themselves before finally being ironed out by time.

Population projections can usually provide a reliable illustration of how age-structural transitions will proceed in the future. Based on the 5th National Census data of 2000, total population and other relevant indicators have been estimated by CPIRC in 2003 for the period 1990-2050 (see Table 2). The fertility level as represented by the TFR is assumed to increase from 1.87 in 2000 to 2.00 in 2010, and drop to 1.88 in 2030 and 1.83 in 2050. The average life expectancy, on the other hand, will rise from 69.5 for males and 74.3 for females in 2000 to 76.6 for males and 81.8 for females in 2050. Note should be made here that the cut-off age for the aged population is 60, instead of 65 as used in Table 1.

Table 2
Projected age distribution 2000-2050, China

| Year | Total population (million) | Age group (%) | | | Total dependency ratio (%) |
|---|---|---|---|---|---|
| | | 0-14 | 15-59 | 60+ | |
| 2000 | 1,267.0 | 21.7 | 67.8 | 10.4 | 47.4 |
| 2005 | 1,322.0 | 19.0 | 70.0 | 11.0 | 42.9 |
| **2010** | **1,377.0** | **16.8** | **70.7** | **12.6** | **41.5** |
| **2015** | **1,430.0** | **15.1** | **69.9** | **15.0** | **43.1** |
| 2020 | 1,472.0 | 15.1 | 68.2 | 16.6 | 46.6 |
| 2030 | 1,525.0 | 10.6 | 66.2 | 23.3 | 51.1 |
| 2040 | 1,544.0 | 11.4 | 62.0 | 26.6 | 61.2 |
| 2050 | 1,522.0 | 9.5 | 61.7 | 28.8 | 62.1 |

Source: CPIRC (2004).

Carvalho (1997) argues that the passage of population waves may provide a "window of opportunity", or what is often termed as a demographic bonus for development, as demographic dependency swings from an orientation towards the youth ages to old-age dependency. In between there is a period when the number of people at working ages reaches a peak and the total dependency ratio drops to low levels. If other factors remain unchanged, a country's economy will certainly profit from a growing labour force and falling expenditure on unproductive segments of the population. Even at the family level, the demographic bonus can bring obvious benefits. For example, baby boomers usually have a large number of siblings. It is easy for them to share the responsibility of supporting their parents. On the other hand, baby boomers themselves usually have fewer children. They do not have to spend too many family resources on childrearing. The money saved can be used for other options, such as improving the quality of life or investing in children's education.

According to the projection results in Table 2, the best "window of opportunity" for China will arrive in around 2010, when the share of people in age groups 15-59 reaches the highest level of 70.7% and the total dependency ratio drops to the lowest level of 41.5%. However, China might have already started enjoying the benefits of the demographic bonus from the 1970s and 1980s when the majority of baby boomers entered the labour force and the total dependency ratio

began to fall. For example, in the period 1980-2000, China achieved fast economic growth, with its per capita GDP quadrupling from $200 to $800 and its foreign currency reserve raised from a deficit of $1.3 billion to a surplus of $165.5 billion. These achievements are commonly attributed to the government introducing policies such as economic restructuring, market liberalization and opening up to the outside world. Rarely mentioned is the contribution made by a growing labour force and a falling dependency ratio. This might be an interesting research topic in the future for economists and demographers alike.

It is certain that before the dependency ratio starts to pick up again around 2015, China will still have over 10 years' time to make full use of the "window of opportunity". The year 2015 is of special significance here because it is a crucial period for the Millennium Development Goals (MDGs), agreed upon by leaders of 189 UN member countries at the Millennium Summit in 2000. It is set as a deadline for improvement in many development goals, such as eradication of extreme poverty and hunger, universal primary education and gender equality. As seen in Table 2, the increase in the dependency ratio around 2015 is caused primarily by the rise in the proportion of the aged population (60+). In comparison, the proportion of children (0-14) continues to decline, only barely offsetting the impact of the elderly. Nevertheless, the change in the proportion of the total working ages (15-59) is negligible. That said, the "window of opportunity" will then close gradually (after 2015).

China's age-structural transitions will continue over the subsequent years. After reaching an historic peak of 1,544 million in 2040, the total population is expected to decline, as the annual increase rate starts to turn negative. By 2050, the total population will stand at 1,522 million. Because all baby boomers will enter retirement ages during this period, the proportion of the elderly will go up to 28.8%. Compared with the previous period from 1990 to 2020, however, the growth rate of the aged population will slow down, simply because the baby boom effect is gradually fading out.

## 5. Age-Structural Transitions at the Provincial Level

China administratively consists of 23 provinces (including Taiwan), 5 autonomous regions and 4 municipalities directly under the

jurisdiction of the State Council. Being a developing country with a vast territory, China has long been troubled by the problem of regional disparities in development. In the last two decades of fast economic growth, moreover, the gap between the advanced coastal regions and the underdeveloped Western provinces has not narrowed but widened. Similar disparities also exist in the area of social progress and development. In this context, the classical theory of demographic transition also applies to the situation inside China. That means, provinces not only find themselves in different stages of development, but also at different stages of the demographic transition. Applying Pool's framework on age-structural transitions, provinces also find themselves in different phases of age-structural transition: a few have already entered Phase 3 (ageing) like Shanghai and Beijing, while others are still moving through Phase 2 of population waves, or are at Phase 1 of simple momentum.

Table 3 gives the percentage distribution of the population by age group, dependency ratios and per capita GDP by regions. The difference between regions is quite impressive. Taking the proportion of population in working age for example, Beijing has the highest proportion at 77.99%, followed by Shanghai at 76.28%. At the bottom of the table is Tibet and Guizhou, both at around 64%. With the highest proportion of young people at 31.19% and the lowest proportion of aged people at 4.75%, Tibet still lags behind in a pre-transition regime. Judged by dependency ratios, Beijing ranks at the top, with the lowest total dependency ratio at 28.22%, which is only half of the highest ratio of 56.58% recorded in Guizhou. In terms of age-structural transitions, however, Shanghai seems more advanced than Beijing, since it has the lowest young dependency ratio at 16.07% and the highest aged dependency ratio at 15.02%. At the other end, Guizhou and Tibet are still left behind as the most backward regions. If per capita GDP can be taken as an indicator of development, a comparison shows that there might be a roughly negative correlation between dependency ratio and development. The higher the per capita GDP a region has, the lesser burden it faces in supporting its dependent population. For example, Shanghai has the highest per capita GDP at 34,547 Yuan and the lowest total dependency ratio at 31.10%, while Guizhou has the lowest per capita GDP at 2,662 Yuan and the highest total dependency ratio at 56.58%. Shanghai's per capita GDP is almost 13 times higher than that of Guizhou. Of course there are some obvious exceptions, like the case of Guangdong where per capita GDP is high but the dependency

Table 3
Selected demographic and economic indicators by region, China, 2000

| Region | Percentage of population by age group | | | Dependency ratio | | | Per capita GDP in RMB (Yuan) |
|---|---|---|---|---|---|---|---|
| | 0-14 | 15-64 | 65+ | Total | Young | Aged | |
| Beijing | 13.59 | **77.99** | 8.42 | 28.22 | 17.43 | 10.80 | 22,460 |
| Shanghai | 12.26 | **76.28** | 11.46 | 31.10 | 16.07 | 15.02 | 34,547 |
| Heilongjiang | 18.89 | **75.55** | 5.56 | 32.36 | 25.00 | 7.36 | 8,562 |
| Jilin | 18.92 | **75.03** | 6.04 | 33.27 | 25.22 | 8.05 | 6,847 |
| Tianjin | 16.76 | **74.82** | 8.41 | 33.64 | 22.40 | 11.24 | 17,993 |
| Liaoning | 17.68 | **74.44** | 7.88 | 34.34 | 23.75 | 10.59 | 11,226 |
| Inner Mongolia | 21.23 | **73.26** | 5.51 | 36.50 | 28.98 | 7.52 | 5,872 |
| Zhejiang | 18.06 | **73.02** | 8.92 | 36.95 | 24.73 | 12.22 | 13,461 |
| Jiangsu | 19.63 | **71.52** | 8.84 | 39.81 | 27.45 | 12.36 | 11,773 |
| Shandong | 20.63 | **71.05** | 8.12 | 40.46 | 29.04 | 11.43 | 9,555 |
| Hubei | 22.80 | **70.78** | 6.42 | 41.28 | 32.21 | 9.07 | 7,188 |
| Hunan | 22.13 | **70.40** | 7.47 | 42.05 | 31.43 | 10.61 | 5,637 |
| Fujian | 23.01 | **70.31** | 6.69 | 42.24 | 32.73 | 9.52 | 11,601 |
| Hebei | 22.78 | **70.17** | 7.05 | 42.51 | 32.46 | 10.05 | 7,663 |
| Chongqing | 21.84 | **70.15** | 8.01 | 42.55 | 31.13 | 11.42 | 5,157 |
| Sichuan | 22.59 | **69.85** | 7.56 | 43.16 | 32.34 | 10.82 | 4,784 |
| Guangdong | 24.11 | **69.71** | 6.17 | 43.44 | 34.59 | 8.85 | 12,885 |
| Shaanxi | 24.94 | **68.91** | 6.15 | 45.12 | 36.19 | 8.92 | 4,549 |
| Qinghai | 26.85 | **68.59** | 4.56 | 45.79 | 39.15 | 6.65 | 5,087 |
| Xinjiang | 27.27 | **68.06** | 4.67 | 46.93 | 40.07 | 6.86 | 7,470 |
| Yunnan | 25.96 | **67.95** | 6.09 | 47.17 | 38.20 | 8.96 | 4,637 |
| Shanxi | 25.73 | **67.94** | 6.33 | 47.19 | 37.87 | 9.32 | 5,137 |
| Gansu | 26.93 | **67.86** | 5.20 | 47.35 | 39.68 | 7.66 | 3,838 |
| Jiangxi | 25.90 | **67.83** | 6.27 | 47.43 | 38.18 | 9.24 | 4,851 |
| Ningxia | 28.37 | **67.15** | 4.47 | 48.91 | 42.25 | 6.66 | 4,839 |
| Henan | 25.89 | **67.00** | 7.10 | 49.24 | 38.64 | 10.60 | 5,444 |
| Anhui | 25.49 | **66.91** | 7.59 | 49.44 | 38.10 | 11.34 | 4,867 |
| Guangxi | 26.19 | **66.51** | 7.30 | 50.35 | 39.38 | 10.98 | 4,319 |
| Hainan | 27.43 | **65.83** | 6.74 | 51.91 | 41.67 | 10.24 | 6,894 |
| Tibet | 31.19 | **64.06** | 4.75 | 56.10 | 48.69 | 7.41 | 4,559 |
| Guizhou | 30.17 | **63.87** | 5.97 | 56.58 | 47.24 | 9.35 | 2,662 |

Source: SSB (2001, 2002).

ratio is high as well. It seems that other factors of development have to be taken into consideration, such as urbanization, education and women's labour-force participation. For example, more urbanized re-

gions, like Liaoning, Jilin and Heilongjiang, tend to have lower dependency ratios. Policy can also make a difference. Although the central government has a national guideline of birth control policy, it is the provincial governments that are responsible to work out local regulations and programmes. Some local policies look very tough, while others sound a little lenient with many "exceptions" and "loopholes". As mentioned in earlier sections of the paper, China's "disordered cohort flows" or "severe oscillations" are largely a result of State manipulation through tough birth control policy and programmes, although the famine in the early 1960s has also left an impact. Difference in policy enforcement could possibly lead to difference in age structure, as shown in the cases of Guangdong and Sichuan to be discussed later.

Variations in age-structural transitions at the provincial level are also reflected in differing shapes of population pyramids. For example, Figure 4 gives the population pyramid of Sichuan, Figure 5 gives that of Guangdong, and Figure 6 gives that of Shanghai. Sichuan, located in central China, used to be the most populous province in China before Chongqing became independent as a municipality directly under the jurisdiction of the State Council in 1997. In 2000 Sichuan's total population stood at 82.3 million, still the third most populous province following Henan (91.2 million) and Guangdong (85.2 million). Economically, Sichuan is considered a relatively underdeveloped province, ranking 25$^{th}$ by per capita GDP in China's 31 administrative divisions (excluding Taiwan). Guangdong, in comparison, is located in the more advanced coastal region of South-East China. Its population size is only slightly higher than that of Sichuan, and Guangdong has a per capita GDP over two times higher. Now among the wealthiest provinces in China second only to Zhejiang, Guangdong belongs to the provinces that have benefited the most from economic restructuring and market liberalization since the early 1980s. Its proximity to Hong Kong has also played a supportive role in the development of the local economy. Shanghai is the largest and the most advanced city in China, with a total population of 16.4 million and a per capita GDP of 34,547 Yuan. It also has the highest level of urbanization in China, with 63.1% of the local population registered as urban.

Figure 4
Population pyramid by five-year age group, Sichuan, 2000

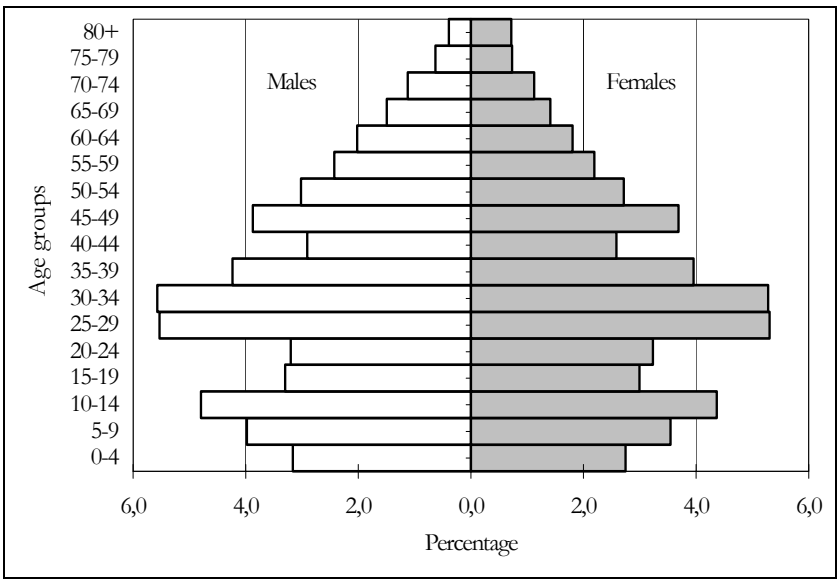



Figure 5
Population pyramid by five-year age group, Guangdong, 2000

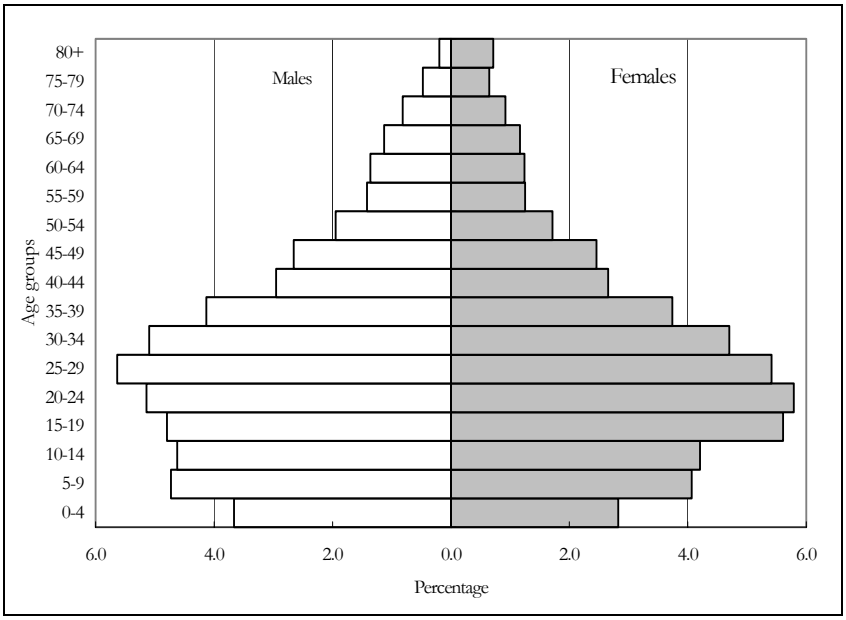
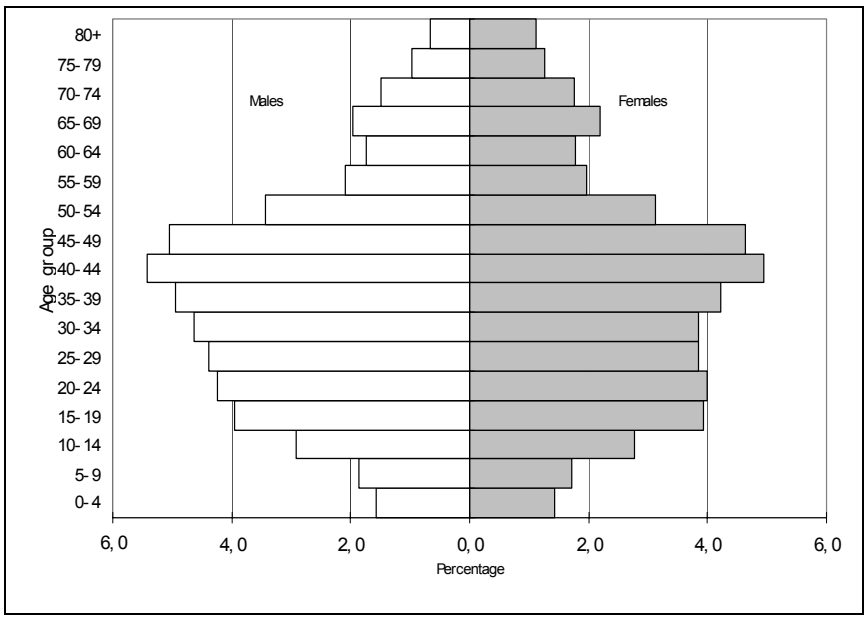


Figure 6
Population pyramid by five-year age group, Shanghai, 2000



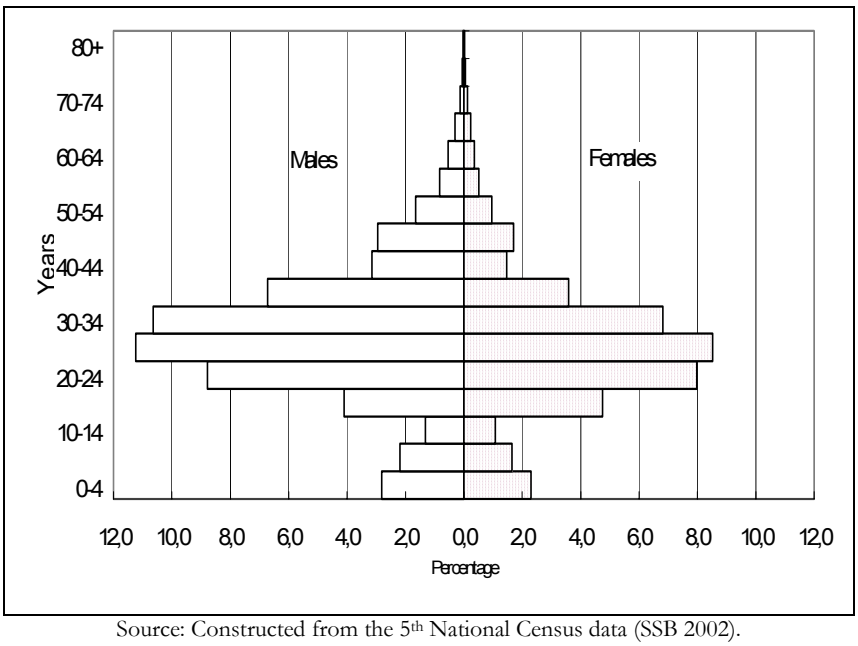

Taking into account the pyramid of China in Figure 2, we can make an interesting comparison among the four pyramids. Figure 4 shows three population waves as similarly observed in Figure 2, but with even sharper shrinkages. It implies that Sichuan might have been more seriously affected than the country as a whole by the famine in the early 1960s, since fewer survivors are left in age groups 40-44. Also the government-sponsored birth control programs might have been more effective in cutting down fertility from the mid 1970s to the mid 1980s, as seen in the sudden shrinkage at age groups 15-24. As in Figure 2, the third wave can be attributed largely to the "echo effect" of the second wave. In comparison, as shown in Figure 5, Guangdong has experienced just one population wave since the 1950s. The famine of the early 1960s has left little hint and the birth control programmes of the 1970s-1980s had only a moderate impact. An educated guess is that, either local policies are very lenient or policies have not been implemented as forcefully as in other places. It seems that the real decline in fertility has started in Guangdong only lately. However, the recent rise in the sex ratio is somewhat worrying, going from the doubtfully

low level of 0.86 in the age group 15-19 up to the quite high level of 1.30 in the age group 0-4. Figure 6 shows that Shanghai has experienced only one population wave like Guangdong. It seems that, after reaching the highest level in the 1950s, Shanghai's fertility started to decline as soon as in the early 1960s when government-sponsored birth control programmes were yet to be introduced. Obviously, the modernization factor has played a decisive role in this context. The later birth control programmes only accelerated this process. In 2000, as shown in Table 3, the proportion of children aged 0-14 (12.26%) was only slightly higher than that of the elderly (11.46%). It is believed that the current fertility in Shanghai is far below replacement, as demonstrated by the fact that the rate of natural increase has been negative for years, at least since 1993 (-0.3% in 2000).

The population pyramids above were constructed from province-specific data of the 5th National Census of 2000. Included in the census are the resident population officially registered in the province, excluding people with temporary resident status. In reality, a province inside China is not closed to people from other provinces. Since the 1980s when the household registration system was relaxed, we have seen massive cross-regional migrations taking place, mainly from rural areas to urban areas, and from the populous but underdeveloped hinterland provinces to the more advanced coastal provinces. It is estimated that as many as 100 million people are on the move every year, leading to the creation by the media of a new term "floating population". Understandably, a "floating population" on such a huge scale can certainly influence the population age structure both in their place of origin as well as at their destination. For example, Sichuan is believed to be the main origin of migrant workers and Guangdong the main destination. In Guangdong, it is estimated that migrant workers totaled 15.1 million in 2000, equal to 17.7% of the local population. In Shanghai, the number of temporary registration holders is believed to have reached 3.9 million, equal to 23.6% of the local population.

It is also widely observed that migrants consist typically of people at young ages, in their prime, especially young males, as shown in the example of Shanghai in Figure 7. Of all migrants surveyed, 73.6% fall into the age groups 20-49, and 57.6% are males. If migrants are allowed to settle down in Shanghai and given permanent resident status in the near future, the age structure of the local population will certainly be altered in favour of the young adult and males, adding even

Figure 7
Population pyramid of temporary residents, Shanghai, 2000




Source: Constructed from the 5th National Census data (SSB 2002).

more vigor and energy to the already prosperous city and adding to cohorts at parental ages (15-49 years for women). Conversely, Sichuan will have lost that source of vitality.

## 6. The Implication of Age-Structural Transitions for the Labour Market

Primarily because of the sheer size of the baby boom population (about 46% of the total population in 2000), people who are in the population waves will at each stage of their life cycle influence the population's age structure as a whole. Their impact can be felt also in every aspect of China's social and economic life, particularly in education, employment and old-age support as they move over time from school ages through working ages to retirement ages. Discussion in this paper focuses mainly on the implications of age-structural transitions to labour market and old-age support in China as a whole. Neverthe-

less, as the preceding section shows, inter-provincial migration will have increased the impacts of disordered cohort flows on the population structure in provinces of origin and destination.

The demographic bonus theory argues that, as baby boomers enter the working ages en masse, a country can benefit economically from a rise in the proportion of the total labour force and a decline in the dependency ratio. The decline in the dependency ratio is of course good news for everybody. However, an inflated labour force does not necessarily lead automatically to economic growth. For better economic results, the contribution of other elements like land (natural resources), capital and technology is also needed. If not properly allocated and fully utilised, there is going to be a mismatch between labour and other productive factors, or an imbalance between demand and supply on the labour market, leading to the undesirable phenomenon of unemployment. For the economy as a whole, unemployment due to the oversupply of labour is considered a burden rather than a bonus. Jobless people consume, not create, social wealth as long as they remain unproductive.

China is the largest developing country in the world. But for its huge population and the almost unlimited supply of labour, China has long been hindered by an insufficient supply of capital, raw materials and technology in its drive for industrialization and modernization over the last few decades. In this context, the coming of the "window of opportunity", as previously discussed, is seen by many people as an additional pressure on economic development and an extraordinary challenge to the government. In 2001, China's total labour force stood at 730 million, with 67.2% classified as rural and 32.8% as urban. In urban areas, the official unemployment rate was 3.6% and 6.8 million people were registered as jobless. On top of that, there were 5.2 million workers laid off temporarily by employers. According to some experts, therefore, the real urban unemployment rate must be 7% or even higher. In rural areas, it is estimated that the total labour surplus lies in the range between 150-200 million. In other words, about 30-40% of the total rural labour force are considered underemployed, if not unemployed (Institute of Labour Science, 2003).

In the next few years, it is believed that the difficulties faced by the labour market can hardly be improved because of a number of reasons. On the supply side, the first challenge comes from the growing number of new labour-market entrants, 20-25 million annually by 2010

according to projections. Another factor is the high level of labour-force participation. At 77.03%, China's labour-force participation rate is considered one of the highest in the world, particularly that for women. On the demand side, economic restructuring and rationalization in recent years have had an unwanted side effect on the labour market by cutting out nearly 40 million jobs, mainly in the loss-making State-owned enterprises. One third of the unemployed have had difficulty in finding new jobs, a labour reservoir consisting largely of women, older workers and people of low education or with few skills. At the same time, technological advances have made it increasingly possible to raise productivity and profit with fewer workers. It is estimated that, in the 20 years since the 1980s, employment elasticity has dropped by two thirds from 0.32 to 0.11. That means that, although the economy is growing at a high rate, the number of new jobs it creates is actually declining. For example, as many as 9.4 million new jobs were created in 2001, but that figure is only half of those that were created annually on average in the 1980s.

For the country as a whole, therefore, it seems difficult to see the results of age-structural transitions as a potential "demographic bonus" that can be exploited quickly in the current circumstances. However, the situation may look different from one province to another. For example, Guangdong has a younger population compared with Heilongjiang, as is shown in Table 3, but has a higher per capita GDP. Although being the second largest province in China, Guangdong has few fears about unemployment. On the contrary, it attracts millions of young people every year from neighbouring provinces to work in its booming economy. In comparison, Heilongjiang has been struggling with massive unemployment for years since the rationalization of State-owned enterprises, the backbone of the local economy. The current high proportion of people at working ages makes the situation probably even worse. It indicates that economic growth is always conditioned by many factors, and we cannot take the "demographic bonus" for granted.

To meet the mounting challenge for the labour market, the government has attached top importance to job creation. A series of policies have been introduced to promote employment in recent years. For example, many preferential policies have been adopted to attract more foreign investment, in order to make full use of China's No. 1 competitive advantage: abundant and cheap labour. China is now one of the

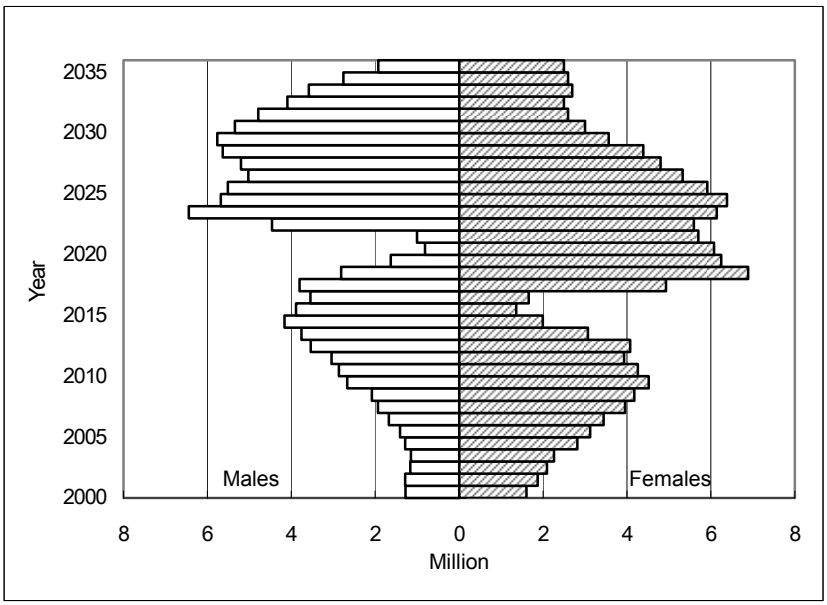
major capital importers in the world, with foreign direct investment reaching as high as US$ 50 billion each year. It is frequent to hear people predicting that China is going to become "factory of the world" by flooding the world market with cheap and quality products. At home, priority is given to the promotion of labour-intensive industries, such as manufactures and service industries, the promotion of the private sector and small and medium-sized enterprises, and the promotion of urbanization. A number of active labour-market policies have also been introduced to promote job matching, training and certification.

## 7. The Implication of Age-Structural Transitions for Old-Age Support

As discussed above, China is going to face an unprecedented challenge of old-age support, as hundreds of millions of baby boomers start to enter retirement ages in the next 10 to 20 years from now. When the majority of baby boomers retire by 2030, China's total elderly population will reach 225 million, and their proportion of the total population will rise to 15%. By that time, this means, almost one in every six persons in China will be classified as old. During the same period, the aged dependency ratio, an indicator regularly used to examine the possible burden the elderly pose on the economically active population, is likely to fall from the current 9:1 to 4:1. In other word, for every elderly person, the number of potential supporters will drop by half from nine to only four.

Also worth noting is the fact that the number of people entering old ages will fluctuate drastically from year to year. Figure 8 gives the number of people expected to retire each year from 2000 to 2035. In China, the formal cut-off age for retirement is 60 for males and 55 for females, resulting in a 5-year difference. Before 2005, about 37 million people will retire each year on average. When the first wave of male baby boomers start to retire after 2010, their female counterparts will have already left the labour force 5 years earlier. During this period, the number of newly retired will rise to 63 million each year on average and will not stop growing before reaching 72 million in 2012. Around 2016 there will be a drop in numbers to 52 million, because of the arrival at that age of the smaller female cohorts born during the famine period 1959-1962. The impact of the smaller male cohorts can only be

Figure 8
Number of people entering retirement ages by year, China, 2000-2035




Source: Reconstructed from Sun (1994).

slightly felt around 2021, being offset by the large female cohorts from the second-wave baby boom. The high tide of retirement comes during the 2020s, when a total of 997 million people exit the labour force gradually. The year 2023 will witness the largest ever cohort, when as many as 125 million will retire in a single year. The number of new retirees will start to decline only after 2030, as the majority of baby boomers are supposed to have stopped working. In reality, not all people cease to work at the official cut-off age of retirement designed primarily for urban dwellers. As found by studies in most developing countries, many rural elderly in China continue to be engaged in various labour activities on and off the farm after 60, either because of lack of a formal retirement programme in the countryside or because of the need to support household economy.

To target the special needs of the elderly people, old-age support may be divided into three broad categories: economic (financial and material), physical and emotional. Old-age support may also be divided by the nature of the provider into two systems: formal and informal.

As far as economic support is concerned, different social welfare policies and old-age pension schemes apply to different regions in China. The place of residence, occupation and the nature of employers' ownership can be decisive factors for people claiming welfare benefits.

In urban areas, an old-age pension scheme was introduced as part of the worker welfare system as early as the 1950s, but it covers only public servants and employees of State-owned enterprises. The old scheme is now under pressure to reform for a number of reasons. On the demand side, the number of entitled people is growing. From 1986 to 1998, for example, the retired workers increased in number from 17.2 million to 34.7 million, the annual per head pension payment from 1,001 Yuan to 5,972 Yuan, and total pension payments from 17.2 billion Yuan to 207.3 billion Yuan. On the supply side, the pay-as-you-go based pension fund is shrinking. Pension funds in some regions ran out of money quickly, leaving the retired with no pay for months. Local governments have to use bank loans to make up the deficits. In 1997 the State Council issued a decree to establish a unified pension system for the entire urban labour force. The new system consists of a basic pension fund and a superannuation system based on personal account. The programme was extended to the non-public sector in 1999. Given the extreme complexity of the system and the huge number of people involved, the transition from the old system to the new one will take years to complete.

Unlike the case in the cities, a formal old-age pension scheme has never been introduced in rural areas. In fact, the government expects or requires that the support of the aged be shouldered by their families and supplemented by community assistance. Most elderly people are supported by family members in the form of shared housing, food and other necessities through co-residence. A pilot old-age insurance programme was introduced in rural areas in 1991. As many as 50 million peasants had joined the programme in the mid 1990s, pooling a total fund of 5 billion Yuan (Ministry of Civil Affairs, 1995). China's economy cannot develop fast enough over the foreseeable future to afford a Western-style social security system to be established in rural areas when baby boomers begin to enter retirement ages. The majority of them will have to rely on other family members for old-age support. In this context, discussions on old-age support, economic support in particular, in rural areas should focus primarily on measures to maintain and enhance the traditional family support system, rather than to in-

troduce a formal pension programme. However, local governments should make efforts to keep the current community welfare system functioning in looking after those unfortunate elderly who might fall out of the family safety net for one reason or other.

## 8. Concluding Remarks

Although age-structural transitions are more or less an indirect result of a country's social and economic development, it obviously has a series of direct implications. In the years to come, age-structural transitions in China will be influenced continuously by people born during the baby boom period 1950s-1970s. They are unique in China's history, not only because of their sheer size but also because of their dramatic experience at almost every stage of their life cycle under the government's numerous efforts of social experimentation. More importantly in the demographic sense, they are the first generation whose fertility behaviour has been strongly influenced by the government's birth control policies. Therefore, the huge baby-boom generation is not only preceded but also followed by smaller generations, resulting in a quite irregular shape of China's population pyramid. The fact that the baby boom is not one wave but several will make planning and policy even more difficult than it already is.

In the next 10-20 years when the size of China's working-age population remains large and the total dependency ratio keeps low, there is a "window of opportunity" waiting to be exploited. Of course, the bonus will not be automatic, but requires sound policy and significant investment. To materialize the opportunity, the government should strive for an even faster growth of the national economy with the potential of abundant labour supply in order to meet the targets of industrialization and modernization. Investment should be made not only in capital construction and technological progress, but also in education and capacity building of the population in general, and the labour force in particular. On the other hand, the government should take advantage of a still relatively young labour force to accelerate the reform of the public pension system in cities. In rural areas, priority should be given to consolidating the family-based old-age support system in the short run, and introducing a formal pension system in the long run.

**References**

CAI, Fang (2003) *Zhongguo Renkou yu Laogong Wenti Baogao No. 4* (China Green Book of Population and Labour No. 4), Shehui Kexue Wenxian Chubanshe, Beijing.

CARVALHO, José Alberto de (1997) Plenary Paper to *IUSSP General Conference, Beijing.*

COWGILL, D O, and HOLMES, L D (1970) "The Demography of Ageing", in Hoffman, A M (ed), *The Daily Needs and Interests of Older People*, Charles C. Thomas, Springfield.

CPIRC (CHINA POPULATION INFORMATION AND RESEARCH CENTRE) (2004) "CPIRC Projection of the Chinese Population 2004", www.cpirc.org.cn/tjsj/tjsj_cy_detail. asp?id=254.

FAN, Jingjing (1995), *China Population Structure by Age and Sex*, Zhongguo Renkou Chubanshe, Beijing.

INSTITUTE OF LABOUR SCIENCE (2003) *China Employment Report 2002,* Zhongguo Laodong Shehui Baozhang Chubanshe, Beijing.

MINISTRY OF CIVIL AFFAIRS (1995) *Nongcun Shehui Yanglao Baoxian Jiben Fangan Lunzheng Baogao* (A Collection of Evaluation Papers on the Basic Plan for Rural Social Pension Insurance), Minzhengbu, Beijing.

POOL, I (2005) "Age-Structural Transitions and Policy: Towards Frameworks", in Tuljapurkar, S, Pool, I and Prachuabmoh, V (eds) *Riding the Age Waves. Vol. I: Population Resources and Development*, IUSSP, International Studies in Population, Dordrecht, Springer: 13-40.

SSB (STATE STATISTICS BUREAU) (2001) *China Statistics Yearbook 2000*, Zhongguo Tongji Chubanshe, Beijing.

SSB (STATE STATISTICS BUREAU) (2002) *Tabulation on the 5th National Census 2000, China*, Zhongguo Tongji Chubanshe, Beijing.

SUN, Jingxin (1994) *The Population of China Towards the 21th Century*, Zhongguo Tongji Chubanshe, Beijing.

UNITED NATIONS (1994) "Overview of Recent Research Findings on Population Ageing and the Family", *Ageing and the Family*, ST/ESA/SER.R/124, New York, UN.

WANG, Weizhi (1985) "Zhongguo Renkou Siwanglu" (Mortality in China), *Zhongguo Renkou Nianjian 1985* (The Population Almanac of China, 1985), Shehui Kexue Chubanshe, Beijing.

Appendix Table 1
Total Fertility Rate (TFR) estimates, China, 1986-1990

| Year | TFR estimated on the State Statistics Bureau data | TFR estimated on the 5th National Census data |
|---|---|---|
| 1986 | 2.42 | 2.38 |
| 1987 | 2.59 | 2.73 |
| 1988 | 2.31 | 2.49 |
| 1989 | 2.25 | 2.45 |
| 1990 | 2.17 | 2.47 |
| 1991 | 2.01 | 2.15 |
| 1992 | 1.84 | 2.10 |
| 1993 | 1.83 | 1.97 |
| 1994 | 1.81 | 1.95 |
| 1995 | 1.78 | 1.90 |
| 1996 | 1.81 | 1.93 |
| 1997 | 1.82 | 1.94 |
| 1998 | 1.82 | 1.95 |
| 1999 | 1.79 | 1.91 |

Source: Cai (2003).

# 12

# AGE-STRUCTURAL TRANSITION IN IRAN: SHORT- AND LONG-TERM CONSEQUENCES OF DRASTIC FERTILITY SWINGS DURING THE FINAL DECADES OF THE TWENTIETH CENTURY

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**Shirin AHMAD-NIA**[2]

***Abstract***

Immediately after the Revolution (1979) the Islamic Republic of Iran (IRI) adopted a pronatalist policy advocating early marriage and childbearing as basic Islamic values. The result was a tremendous rise in fertility rate and a drastic change in the age structure of the population. Although the baby-boom period was rather short and the antinatalist policy adopted in 1989 has been surprisingly successful, the age-structural transition (AST) produced by the pronatalist policy has already affected various aspects of the Iranian society. The entry of the baby boomers into the school system (from 1984 on) led to a heavy burden on various levels of the educational system. Their grad-

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This paper is based on a research project funded by the High Institute for Management and Planning Studies, Tehran, Iran. The second author wishes to express her gratitude to Dr M. A. Mirzaee, Chairman, Afzalipour Foundation for Promotion of Scientific Research, Kerman, Iran, for generously funding her attendance at the CICRED Seminar.

ual entry into the labour market (from around 1995) has contributed significantly to the current unemployment crisis. Their impact on the housing market is also already being felt. Their eventual exit from the labour market (in the early 2040s) looms as a major threat to Iran's social security system. The aim of this paper is to review the process and dynamics of AST in Iran and to explore its medium- and long-term consequences for the social and economic development of the country.

## 1. Introduction

The international debate on population, which began as part of the general discourse on development after the Second World War, had until recently been dominated by the demographic transition theory and its preoccupation with the consequences of the disturbed balance of births and deaths. The policy and practical objective of this concern was to find out how and how soon developing countries burdened with high rates of population growth could be helped to lower their fertility rate. The impact of the latter on the age structure and the composition of the population received little serious attention. The idea of age structure and its close links with and unavoidable impact on fertility and mortality dynamics had of course been long recognized by demographers like Keyfitz (1977). Such classical writers on population and development as Coale and Hoover (1958) had also offered insightful discussions concerning the impact of changing population age structure on national savings, investment and economic growth. But little serious note had been taken of problems that the age structure resulting from lowered fertility and mortality rates would pose for developing countries.

Since the mid 1980s, however, most developing countries have shown promising signs of fertility decline and the potential consequences of the changes in age structure have received growing recognition by demographers, economists and policy makers. This has led to the emergence of new concepts like *age-structural transition, demographic bonus,* and *demographic window of opportunity*. It has become clear that, following fertility declines, a period of demographic change will be ushered in during which the number and relative size of the young, working-age population will surpass that of children (ages 0-15) and

the elderly (ages 65+). This period will present developing countries with a unique opportunity to invest in human capital formation, improve the quality of their labour force and stimulate economic growth. The process has already been documented in South East Asia and some Latin American countries.

Iran, like other developing countries, has been deeply concerned with the process of the demographic transition since the 1950s. Initial efforts to control fertility and population growth by the establishment of a national family planning programme were interrupted by the eruption of the Islamic Revolution in 1979 and by the strongly pronatalist atmosphere created by war, and postponed Iran's demographic transition for almost ten years. Since 1989, however, when the government adopted a birth control policy and the family planning programme was revived, the situation has changed drastically. The success of the Iranian programme, which helped raise contraceptive prevalence to above 60% of eligible married couples in less than five years, has in fact surprised many observers. The equally sharp decline in marital fertility rates to almost replacement level by the late 1990s has also taken most observers by surprise. As a result of these achievements, the age structure of the Iranian population has begun to change. By 1996, when the last census was held, the share of children aged 0-14 had fallen below 40 per cent of the population while the share of the elderly had risen above four per cent. Several large-scale surveys conducted between 1997-2003 strongly suggest that the process of fertility decline is continuing. The demographic window of opportunity thus opened deserves close scrutiny and analysis. The aim of this paper is to review the unfolding picture of age-structural transition in Iran and to explore its policy implications.

## 2. Sources of Data

Data used in this analysis consist of two main types: census and survey results for the period 1956-2003 and projections for the period 2000-2050. In addition to decennial censuses conducted since 1956 and the combined census-survey conducted in 1991, the last decade has witnessed the implementation of several large-scale surveys. Among these, the Population Growth Estimation Survey conducted by the Statistical Centre of Iran (SCI) in 1997-1998 provides a wealth of data

on fertility rates of Iranian couples. The information provided by this survey has been confirmed by the results of the huge, nationwide DHS-type survey conducted jointly by the SCI and by the Ministry of Health and Medical Education (MOHME) in October 2000 (MOHME 2001; Mehryar 2002).

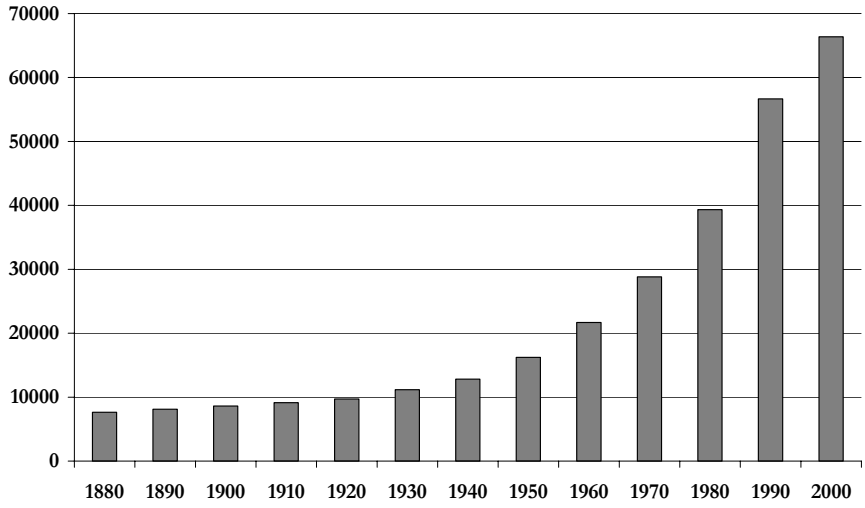
The large-scale Household Survey on Characteristics of Employment and Unemployment (HSCEU) initiated in 1998 and carried out on a quarterly basis since 2000 has provided up-to-date information on such socio-demographic characteristics as education, labour-force participation, marital status and age structure of both urban and rural populations. As far as morbidity and mortality trends are concerned, a recent study conducted by the MOHME (2000-2001) has resulted in the collection of a mass of detailed information on mortality by cause of death, province, age, sex and urban/rural residence. The first two volumes of this monumental study which cover 18 of the 28 provinces have revealed clear evidence of a drastic fall in mortality rates and an advanced stage of epidemiological transition in Iran, with cardiovascular diseases, cancers and road accidents emerging as the main causes of mortality. For the period 2000-2050, use will be made of the revised low and medium variant projections of the UN Population Division (UN 2003a, b).

## 3. Historical Context and Changes in Policy

The population of Iran is estimated to have been about 9.5 million at the start of the 20$^{th}$ century. By 1956 when the first census was taken it had risen to 19 million. Thus, due to the traditional balance between high fertility and mortality rates, Iran's population had taken 50 years to double. The age structure revealed by the 1956 census was, however, indicative of a very young and rapidly growing population. The second census taken in 1966 revealed a total population of 26 million growing at the annual rate of 3.1 per cent. At this rate of growth Iran's population would double in less than 25 years. Results of the 1966 census also suggested that the birth rate had gone up only slightly since the 1940s, while the mortality rate had declined significantly (see Figure 1).

A family planning programme with explicit demographic and health goals was introduced in 1967. In combination with other development and modernization processes, the programme was able to

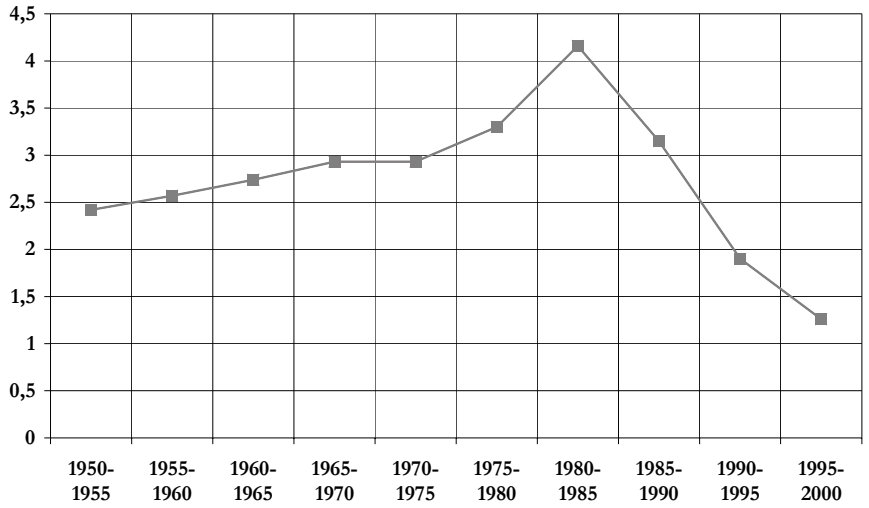
Figure 1
Estimated population of Iran (in 1000s), 1880-2000




bring about some changes in the fertility desires and behaviour of married couples, particularly in urban areas. These were reflected in the results of the third census taken in 1976 which showed a population size of 34.5 million growing at the average rate of 2.7 per cent per year. The relatively large decline in growth rate (from 3.1 to 2.7 per cent) revealed by the 1976 census was suggestive of the beginning of a new phase of demographic transition in Iran. A comparison of the growth rate indicated by this census with the much higher rates demonstrated by the censuses preceding (1966, 3.1%) and following it (1986, 3.9%) has led some demographers to speak of a "stalled transition" in Iran (Aghajanian 1991) (see Figure 2).

Shortly after the publication of the results of the 1976 census, Iran went through a period of political protest and rebellion which ended in the establishment of the Islamic Republic of Iran in early 1979. The new regime adopted a pronatalist policy. Early marriage and reproduction were presented and promoted as basic Islamic values and the national family planning programme was suspended. Individual couples were, however, free to use contraceptives available through both public MCH clinics and the private sector (Mehryar 2001).

Figure 2
Annual growth rate (%) of Iran's population, 1950-2000




The impact of this policy reversal was clearly reflected in the results of the 1986 census which showed that the population of Iran had risen to 49.4 million and was growing at the very rapid rate of 3.9% per annum. In terms of a fraction of the total population size, the intercensal gain which had fallen from 36.1% between 1956-1966 to 30.7% between 1966-1976, had climbed up to 46.7% between 1976-1986. The heightened rate of growth (from 2.7 to 3.9 per cent) was noticeable in both urban (from 4.93 to 5.41 per cent) and rural areas (from 1.11 to 2.39 per cent) of the country.

The publication of the results of the 1986 census coincided with the final years of the eight-year war against Iraq and the beginning of the post-war reconstruction programme. The extremely high rate of growth revealed by the 1986 census in combination with growing evidence of the depletion of Iran's oil revenues persuaded IRI authorities to adopt an antinatalist policy and revive the long-suspended family planning programme in 1989.

Contrary to all expectations, the new policy was enthusiastically received by the people. By 1994, that is in less than five years, the contraceptive prevalence rate (CPR) had gone up to 64 per cent of eligible couples and there were clear signs of a precipitous fall in fertility rates. The last census held in 1996 revealed a total population size of 60 mil-

lion (as compared with the figure of 76 million projected by the UN Population Division in 1996) growing at the modest rate of 1.9% per annum. There were also clear signs of a remarkable drop in both fertility (from a TFR of 6.5 to 2.6) and mortality (from an estimated crude death rate (CDR) of 12 to 6 per 1000).

The age structure of the population had also undergone some impressive changes. For the first time in Iran's demographic history, the proportion of children aged 0-14 had fallen below 40% while that of the elderly aged 65+ had risen above four per cent. In contrast the share of the potentially productive group aged 15-64 years had risen to over 55%. There was thus clear evidence of the opening of a demographic window of opportunity in Iran by the late 1990s.

Large-scale nationally representative surveys conducted since 1996 suggest that the downward trend in fertility revealed by the 1996 census has continued. National estimates of Iran's population size at the dawn of the 21st century vary between 63.5 and 64.3 million. The UN projections for the period 2000-2050 revised in 2002 are also now based on a considerably reduced base population size of 66.4 million.

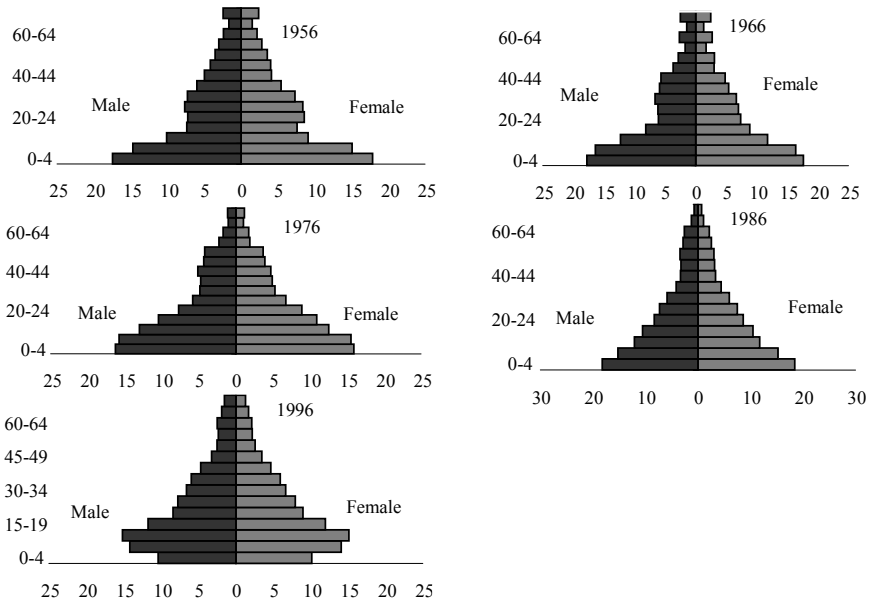
## 4. Age-Structural Changes, 1956-1966

### *4.1. The General Picture*

A glance at the age pyramid for 1956 (Figure 3) reveals a striking rise in the population growth rate during the 15-year period preceding the first census (1941-1956). There is a marked shrinkage at age levels 15-24 (cohorts born between 1932-1941). The next two age brackets are somewhat larger but also of a more or less rectangular nature. From age 34 on the pyramid takes a smooth triangular shape.

The pyramid for 1966, while less regular than that of 1956, confirms the high fertility and rapid population growth rate that have taken place since the early 1940s. The shrunken rectangular shape of the age groups 20-29, and to some extent 30-39, is not too different from the one given in the 1956 pyramid. There is also some suggestion of a slight decline in the number of children aged 0-4, that is those born during the second half of the decade preceding the census. The pyramid for 1976 has a more regular triangular shape but its lowest

Figure 3
Age pyramids revealed by decennial censuses, 1956-1996




rung is clearly indicative of a noticeable fall in the number of children born between 1971-1976. This may be taken as a sign of the growing impact of the FP programme introduced in 1967.

In contrast, the age pyramid for 1986 has a broader base and more regularly declining shape until ages 30-34. Although Iran is known to have lost a large number (estimated about 250,000) of relatively young men during the Revolution and eight-year war (1980-1988), there is little sign of this in the 1986 pyramid. Presumably, the marked decline in general mortality that has taken place since the 1980s and the inclusion of a large group of Afghan refugees in the 1986 and 1996 censuses have compensated for the war-related mortality. The pyramid for 1996 is different from all four previous pyramids in that it reveals a clear fall in the number and relative share of children aged 0-9. The fall is particularly impressive for age group 0-4 and confirms other evidence regarding the acceleration of the fertility decline since 1991. Age pyramids for urban and rural areas in 1996 are very similar and indicate that the huge fertility decline experienced by Iran since the late 1980s has not been limited to urban areas only.

Judging by the age pyramids for 1956 and 1966, Iran would seem to have experienced a baby boom between 1940-1966. The gradual entry of the large number of children born during this period into reproductive career could have played a role in dampening the impact of the family planning programme between 1967-1979. The large number of women born during the period 1945-1966 was probably also responsible for the sudden rise in fertility after the Revolution. The group of 20-40-year-old women whose lowered fertility resulted in the surprisingly low growth rate revealed by the 1996 census mostly belong to the cohort born between 1966 and 1976. To what extent the low fertility demonstrated by this birth cohort was influenced by the fact that they were born during a period dominated by an active family planning programme and an antinatalist atmosphere remains to be demonstrated.

### *4.2. Major Age Groups*

As indicated in Figure 4, the number of people falling into each of the three major age groups of 0-14, 15-64 and 65+ years has grown enormously in consecutive censuses taken between 1956-1996. The relative share of these groups in the total population had, however, remained relatively stable until the early 1990s (Figure 5). The age structure of the population enumerated in 1966 differed only slightly from that of the 1956 census. While the proportion of children aged 0-14 had risen (from 42.2% to 46.1%), that of the population aged 65+ had dropped slightly (from 3.9% to 3.7%). As a result the total and child dependency ratios of the population had gone up markedly (from 85% and 78% to 99% and 92%, respectively) but the aged dependency ratio had remained constant at seven per cent.

By 1976, the share of children in the total population had dropped slightly (44.5% as compared with the figure of 46.1% in 1966) but there was no commensurate rise in the share of the elderly. If anything, the share of the population aged 65+ had declined slightly (from 3.7% to 3.5%). As a result, while the total and child dependency ratios of the population enumerated in 1976 (93% and 86%) are lower than those for 1966 (99% and 92%), there is virtually no change in the dependency ratio of the elderly (seven per cent).

Figure 4
Number of people aged 0-14, 15-64 and 65+ years
enumerated between 1956-1996

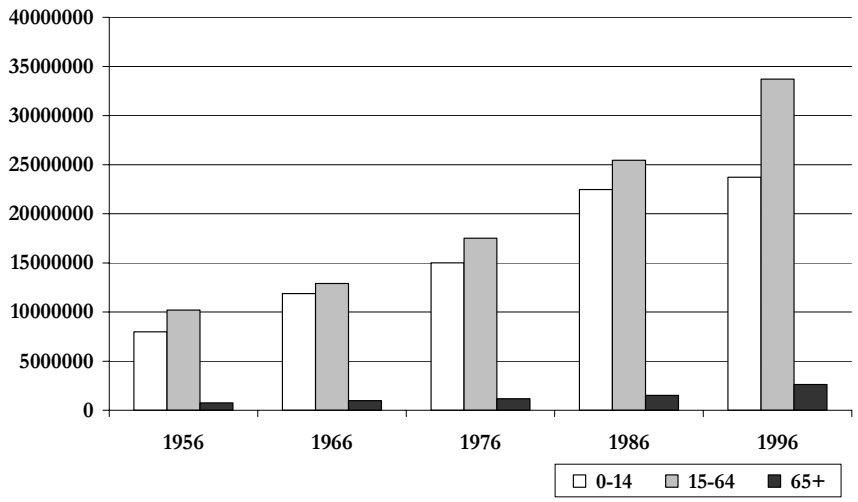
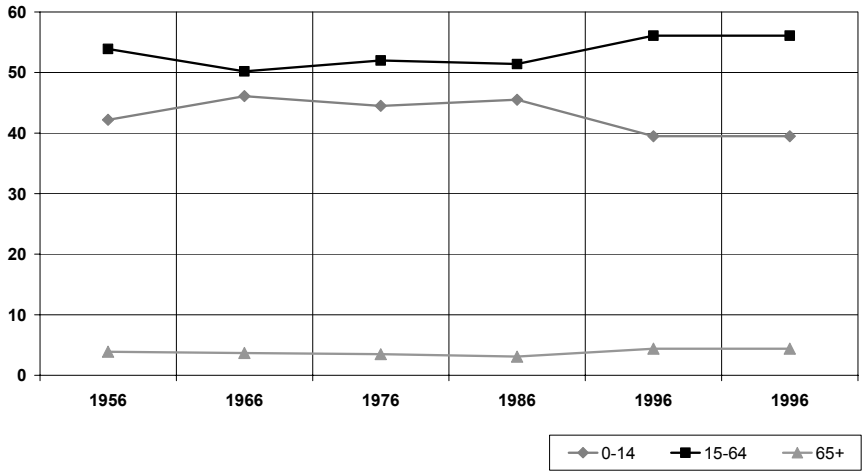
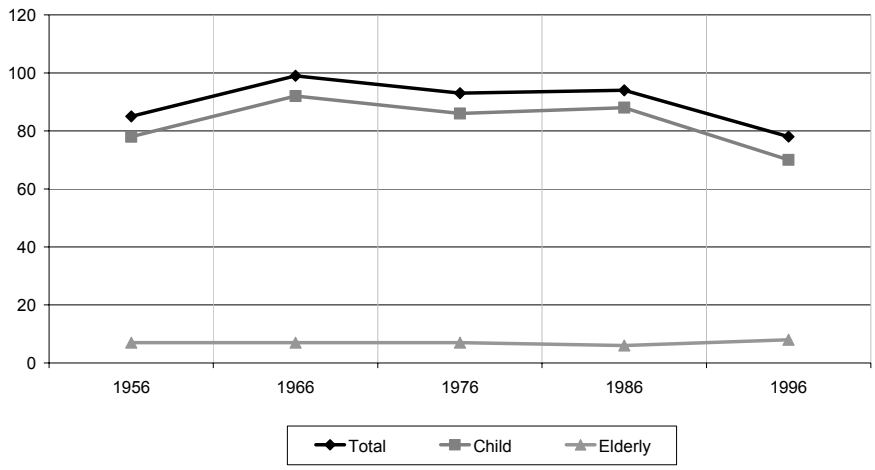



Figure 5
Share (%) of the three main age groups in the total population, 1956-1996



The following decade witnessed a huge increase in the size, fertility and growth rate of the Iranian population. The share of children aged 0-14 enumerated in 1986 (45.5%) is only slightly higher than that of 1976 (44.5%), but lower than the figure for 1966 (46.1%). At the same time, the proportionate share of the population aged 65+ had fallen to the all-time low level of 3.1%. But these ratios may give a misleading impression of the reality. The *number* of children born during the decade preceding the 1986 census (16,570,717) was 1.55 times the figure for 1976 (10,706,245). Similarly, the *number* of the elderly enumerated in 1986 (1,532,795) is almost thirty per cent larger than the number enumerated in 1976 (1,179,806). The total and child dependency ratios for 1986 (94% and 88%) fall between those for 1966 (99% and 92%) and 1976 (93% and 86%) while that for the elderly (6%) is lower.

Figure 6
Changes in total, child and elderly dependency ratios, 1956-1996




The sharp drop in the fertility rate of the Iranian population during 1986-1996 is clearly reflected in the age pyramid for 1996. For the first time, there is a noticeable dent in the two lowest layers of the pyramid representing the age groups 0-4 and 5-9. The dent for the 0-4 age group, that is, the cohort born between 1991-1996, is particularly impressive. It is equally visible in the age pyramid of both urban and rural populations.

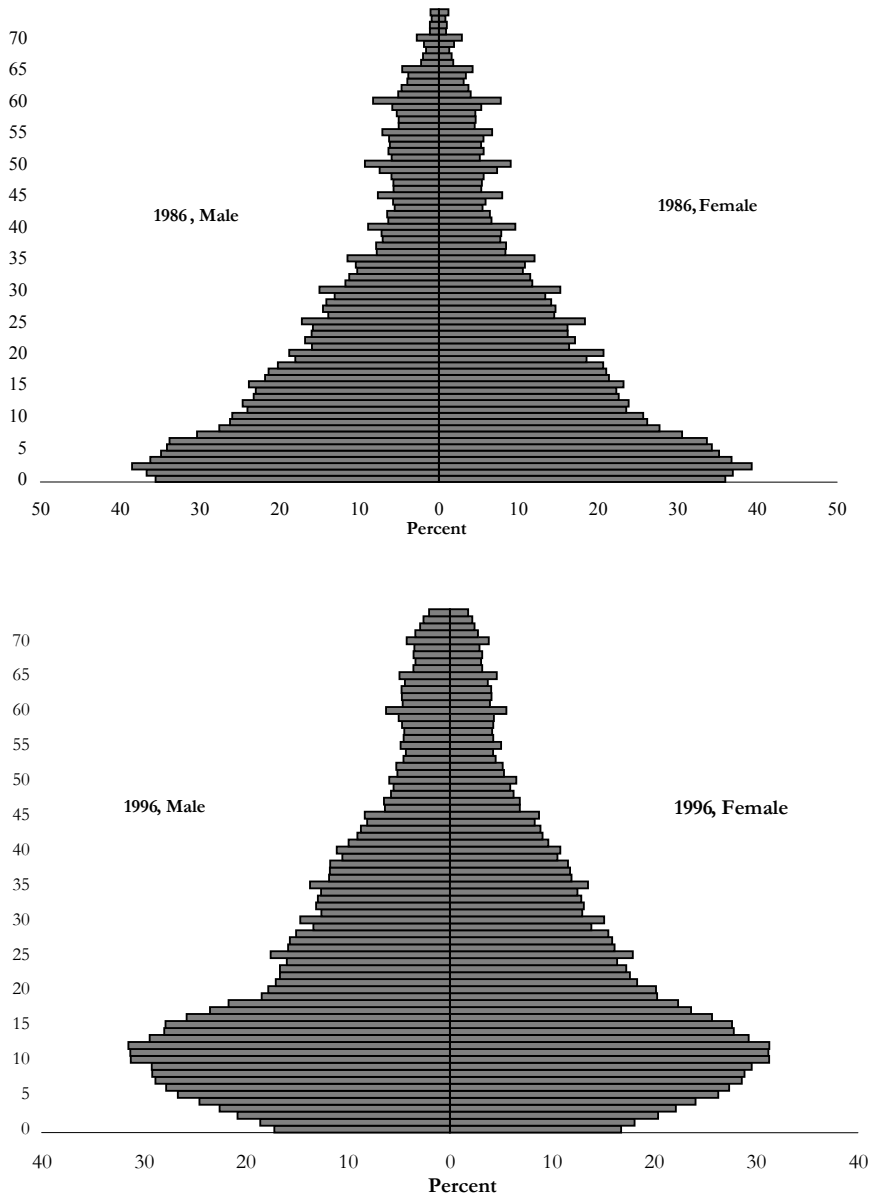
Looking at the more detailed, single-year age pyramids for 1986 and 1996 (Figure 7), there is clear evidence of a systematic fall in the number of children born annually between 1987 and 1996. In urban areas there is a sharp drop in the number of children born between 1986 and 1987. The fall, although still there, becomes less noticeable between 1987-1989 but more impressive over the next 7 years (1990-1996). In rural areas, there is a sudden fall between 1986-1987 ending in 1990, with an almost fifty per cent fall between 1990-1991 but an increasingly larger annual decrease between 1991-1996.

The baby-boom period initiated by the Revolution thus would seem to have been rather short-lived. In fact, looking at the number of people born between 1976-1986 covered by the 1986 census, it would appear that peak fertility rates were achieved between 1984 (in urban areas) and 1985 (in rural areas). Births registered by the Civil Registration Organisation (CRO) indicate an even earlier date (1981) for the fertility peak. The combined census-survey conducted in 1991 is also clearly indicative of a downward trend in the number of children born after 1987. By this time, the share of children aged 0-4 years in the total population had decreased to 44.3%, while that of the elderly had risen to 3.5%. Nevertheless, the total, child and elderly dependency ratios (92%, 85% and 7%) revealed by the 1991 census-survey are hardly different from those of the 1976 census (93%, 86% and 7%).

The downward trend in fertility revealed by the 1991 census-survey took a more precipitous form during 1991-1996. This is clearly reflected in the results of the 1996 census which revealed a much smaller population size than generally anticipated. For the first time in the recent history of Iran, the share of children aged 0-14 (39.5%) was below 40%. Of the latter, only about a quarter (26%) had been born during the preceding five-year period (1991-1996). On the other hand, the 1996 census recorded a small but significant rise in the share of the elderly (4.4% as compared with 3.1% in 1986). Due to these changes, the total and child dependency ratios revealed by the 1996 census (78% and 70%) are markedly lower than those derived from earlier censuses while the elderly dependency ratio has risen to eight per cent.

According to the DHS-type survey conducted in October 2000, the share of children in the total population had fallen to 34.5% while that of the elderly had risen above 5%. As a result, the total and child dependency ratios had fallen to 66% and 57% (as compared with 78% and 70% in 1996) and the dependency ratio due to the elderly had gone

Figure 7
Single-year age pyramids, 1986 and 1996 censuses



up to nine per cent. The Household Employment Surveys conducted in 2002 and 2003 indicate further declines in the relative share of children (to around 28.5% as compared with the figures of 39.5% in 1996 and 45.5% in 1986) but the relative share of the elderly has remained constant at around five per cent. The total and child dependency ratios derived from these surveys (50.5% and 43%) are almost one half of those obtained by the 1966 census. The dependency ratio of the elderly (7-8 per cent) has, however, remained at almost the same level as in 1956-1976 and 1991.

### *4.3. The 1996 Census and More Recent Surveys*

Of the 60 million people enumerated in 1996, 30.84 million (51%) had been born during the preceding two decades. Of this group, at least 28.5 million had been born since the establishment of the Islamic Republic of Iran, that is, between 1979-1996. This is by far the largest number added to Iran's population within an 18-year period since 1956. By contrast, the number of children aged 0-9 years enumerated in the preceding three censuses (1956-1976) was only 25.6 million. Thus the cohort born between 1979 and 1996 constitutes a major cohort or *wave* that will affect the future shape of the Iranian population during the 21st century. In view of the clear evidence of a sharp decline in fertility between 1991-1996, one might even be tempted to exclude children born during the second half of the decade preceding the 1996 census and concentrate on the group of children born between 1977 and 1991 (about 22.2 million in 1996) as the crucial wave to be monitored.

The cohort born between 1976-1996 covers four important subgroups corresponding to five-year intervals, 1976-1981, 1982-1986, 1987-1991 and 1992-1996. Each of these cohorts is associated with different historical landmarks. The first five-year period (1976-1981) partly overlaps with the final years of the old regime. Thanks to the oil glut of the early 1970s, during this period most Iranian families, particularly those living in big urban centres, enjoyed unprecedented prosperity and developed unrealistically high expectations regarding the future. The second five-year period (1982-1986) coincided with the eight-year war with Iraq and the pronatalist atmosphere created by it.

The third five-year period corresponds to the final years of the war against Iraq and was characterised by devastating signs of war-related damage to the infrastructure, a sharp drop in the national capacity to

produce and market oil, a decline in economic growth, and growing doubts regarding the relevance and attainability of the declared objectives of the war. These conditions were mostly responsible for the Iranian government's decision to accept UN Security Council's Resolution No. 582 on a ceasefire and to acknowledge rapid population growth as a major impediment to economic growth and national welfare. It was towards the end of this period that Iran adopted an antinatalist policy and the family planning programme was officially revived (1989).

The fourth and last period (1992-1996) coincides with the development of post-war reconstruction plans calling for economic readjustment, gradual removal of subsidies and government control on prices, privatization, and the streamlining of the State bureaucracies. The continued economic blockade by the United States and mismanagement of resources hampered the achievement of economic growth targets set by the planners, and resulted in higher rates of inflation, unemployment and widespread economic hardship. These pressures, along with improvements in the levels of education of the people, particularly women, media exposure and the modernization of the Iranian society no doubt contributed to the unexpected success of the revived family planning programme and resulted in the rapid fertility decline that has characterised the last five-year period (1992-1996). Although no census has been carried out since 1996, several large-scale nationally representative sample surveys conducted since then have provided clear evidence of the continuation of the fertility decline and of the age-structural changes indicated by the 1996 census.

## 5. Challenges Posed by Age-Structural Changes Since 1976

As suggested earlier, the trend, size and shape of Iran's population is likely to be strongly determined by the large cohort born between 1976-1996. Obviously, a birth cohort covering two decades will pass through different stages of the life course at different times and its reaction to the particular demands of that stage will be strongly affected by the social, economic and political conditions prevailing at the time. The cohort born between 1976-1981 entered its formal schooling career in 1983 and raised demand for primary education facilities/services considerably. Being constitutionally obliged to provide all

children with free education, the government of the IRI responded with increased investment in teacher training and recruitment, by building schools and by introducing a two-shift schooling system that allowed use of the same premises by two different groups of children, teachers and administrators. When this cohort reached age 12 (1987-1989) a similar pressure was experienced by the junior secondary school system. The same happened when the wave reached age 15 and a higher demand for senior secondary school facilities became evident.

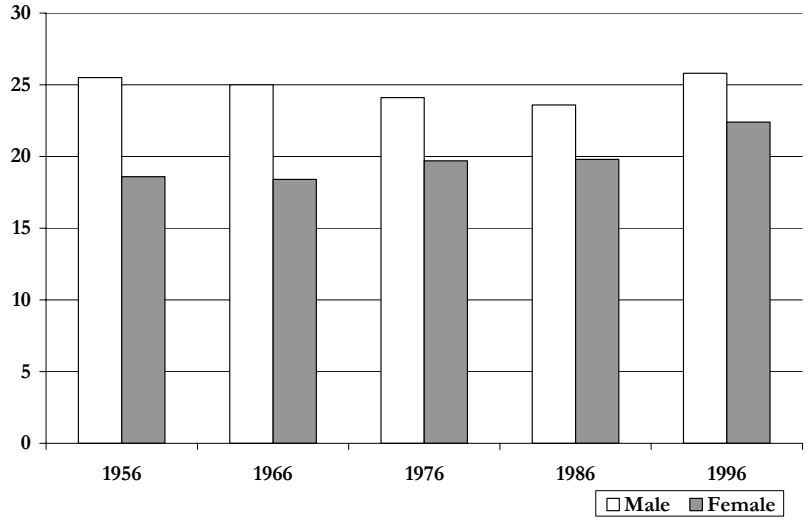
Thanks to the experience gained and investments made during this period, the educational system was better prepared for the larger wave coming from the 1982-1986 birth cohort when it reached the age of formal schooling. On the other hand, by the time the much smaller cohort of children born between 1987-1991 reached their school age there were clear signs of excess capacity at the primary school level. This resulted in the closure of a considerable number of primary-school teacher training centres established during the first decade after the Revolution.

Earlier, the sudden increase in the number of young children had presented Iran with the serious problem of feeding them. The problem was partly responsible for the breastfeeding campaign launched by the Ministry of Health and Medical Education (MOHME). Thanks to the full support of religious leaders and the active participation of grass-roots organizations and the public mobilization system created during the Revolution and war, the campaign proved singularly successful and Iran came to be acknowledged as a regional leader in successfully promoting breastfeeding. Interestingly, the breastfeeding campaign was designed and implemented under the leadership of the same Minister of Health (a US-trained pediatrician) who had played a major role in persuading the government to adopt an antinatalist policy and revive the family planning programme in 1989.

When the large number of children born between 1976-1986 reached the age of higher education in the early 1990s, there was an enormous increase in the number of university applicants. The remarkable expansion of opportunities for higher education through both public and private sector initiatives during the preceding decade was able to absorb the shock, although at the expense of quality. As the process has continued, the creation of opportunities for higher education has taken critical dimensions and the problem of finding alternative sources of funding for higher education or further expanding the

existing private sector has become a subject of much heated debate. Because of the rising social demand for higher education and the relatively small ratio of secondary school graduates who are currently able to enter universities, the pressure on higher education will most probably continue to rise for decades to come.

Figure 8
Mean age at marriage of Iranian men and women, 1956-1996




The gradual entry of the huge birth cohorts of 1976-1991 into the labour market has also confronted Iran with huge problems of unemployment and job creation in recent years. Again the problem is unlikely to be solved for decades to come, as is the problem of housing created by the entry of this cohort into family formation and reproductive phases of life. In this respect it might be of interest to note that despite all the emphasis put on early marriage as a basic Islamic value since the Revolution, the age of marriage has in fact gone up considerably over the past 20 years (Figure 8). The upward trend has been noticeable among both men and women, especially the latter, regardless of urban-rural status. This may have slightly eased the pressure on housing and other family-formation related services, but the pressures would seem to have been temporarily postponed and are likely to be felt again in full strength in the near future.

## 6. Signs of the Opening of a Demographic Window of Opportunity

As a result of the sudden decrease in fertility between 1991-1996, the number and relative share of children aged 0-4 dropped significantly. The trend would seem to have continued at least until early 2003 when the last Household Employment Survey was conducted. According to the latter survey, only 7.2% of the population covered was aged 0-4. This is significantly lower than the figures obtained by the 1986 (18.3%) and 1996 (10.3%) censuses. As a result of this change, the total and child dependency ratios have fallen to 50% and 43% as compared with 70% and 78% in 1996. The old-age dependency ratio (7%) has, however, remained more or less constant between its 1986 (6%) and 1996 levels (8%).

Despite its size (3.9% per annum), the growth rate experienced by the Iranian population between 1976 and 1988 failed to raise the relative share of children aged 0-14 above its 1966 level. By 1991 it had dropped below its 1976 value (44.3%) and by 1996 it was below 40%, the conventional cut-off point for considering a population as "young" (Cowgill and Holmes, 1970). The DHS-type survey carried out in late 2000 has given the figure 34.5% which is very close to that (35.5%) used in the 2002 revision of the UN projections. Meanwhile, the share of older ages (people aged 65+) which had taken a downward trend between 1956-1986 showed an upward rise in 1991 and by 1996 accounted for 4.4% of the total population. Surveys taken between 2000-2003 indicate that it had continued to grow and had risen above five per cent by the end of the century.

On the other hand, the share of the potentially active population aged 15-64 years which had vacillated around 52% between 1956-1986, had risen to 56.1% by 1996 and according to surveys taken in 2002 and 2003 it now accounts for around two thirds of the Iranian population. This rise may be taken as a sign that the demographic window of opportunity which began to open in 1996 has grown wider over the past eight years. This is clearly reflected in Figures 4 and 5 which present the number and proportion of people falling into each of the three main groups (0-14, 15-64 and 65+ years of age).

As indicated by Figure 4, the size of the potentially productive population (aged 15-64) enumerated in 1996 was almost equal to the total population of Iran in 1976. The number of people aged 15-64 exceeded

that of those aged 0-14 and 65+ by over seven million, which is more than 12% of the enumerated population. This difference may be taken as a sign of the enlarged size of the window of opportunity.

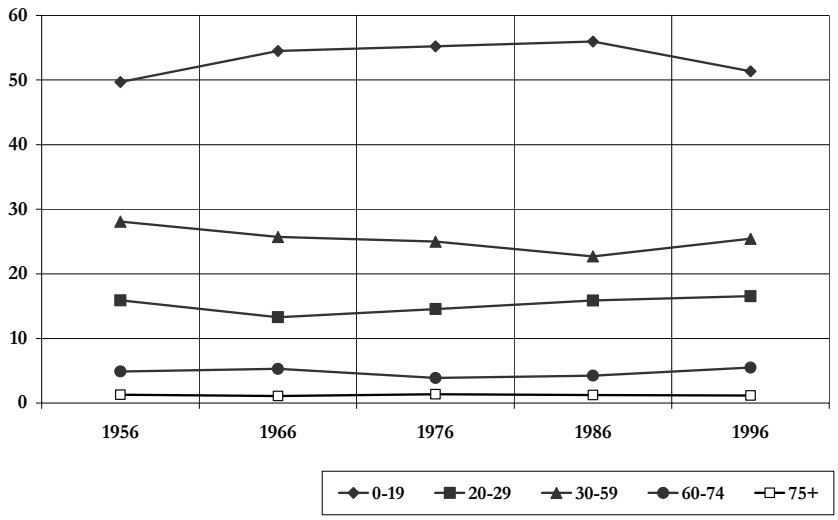
Not all of the people aged 15-64 are, in reality, economically active and productive. The majority of youngsters aged 15-19 are attending school. In 2003 only about one third of this age group was considered as economically active, that is employed or looking for employment. A smaller proportion of youth aged 20-24 and 25-29 are also either students or in the process of deciding on a career. Moreover, Iran, like most other Middle East countries, has a very low rate of female labour-force participation which has declined further since the Revolution. Labour-force participation of women, which had risen to above 12% in 1976, had dropped to about 8.5% in 1986 and was only 9.4% by 1996. According to the latest survey (2003), it is still below 12%. Assuming that men and women have an equal share of the group aged 25-64 and all of men plus 13% of women participate in the labour force, the ratio of people actually active will be much smaller than the figures given above.

In addition to the three major groups discussed above, one may consider other age groups and explore how their share of the population has changed in the past, and how this will change as the population goes through later stages of transition. In this analysis the following five age groups will be considered: 0-19, 20-29, 30-59, 60-74 and 75+. These groups in a way represent children (ages 0-14 years) and adolescents (ages 15-19) who need parental care and full-time schooling, youth (20-29) of whom some may still be continuing full-time formal education but the majority will be at the stage of occupational training, looking for a job and forming families. While differing in age, both groups need a good deal of public investment and support in order to develop their human capital and make appropriate use of it.

The third group covers the young adult population with more or less full-time jobs and contributing to national production of goods and services. In addition to paying for their own expenses and those of the younger members of their family this age group also takes the lion's share in paying taxes, contributing to social security funds and making savings that provide the capital needed for investment in economic growth. The fourth group (60-74) covers the relatively younger segment of the aged population. Depending on local circumstances, a considerable proportion of this group may be economically active and

performing some of the productive activities carried out by the young adult group. A growing proportion of this group will, however, be pensioners whose major demand will be in the area of health care services and pensions. The fifth sub-group, the "oldest of the elderly", will be predominantly unable to work and will need a good deal of social and health services to continue a decent life. Figure 9 gives the share of these five groups of the population enumerated between 1956-1996.

Figure 9
Share (%) of five major age groups (0-19, 20-29, 30-59, 60-74 and 75+) of the population of Iran, 1956-1996




## 7. Future Trends, 2000-2050

In this section, the future course of age-structural transition in Iran will be considered. For this purpose, the medium variant projection of the UN Population Division (2002 Revision) will be used as the basis. It may be of interest to note that, following the unexpectedly huge rise in fertility and population growth rates of Iran in the 1980s, the United Nations drastically revised its population projections for Iran. The 1996 Revision (published in 1998, that is two years after the completion of the 1996 census) estimated Iran's population in 1995 to

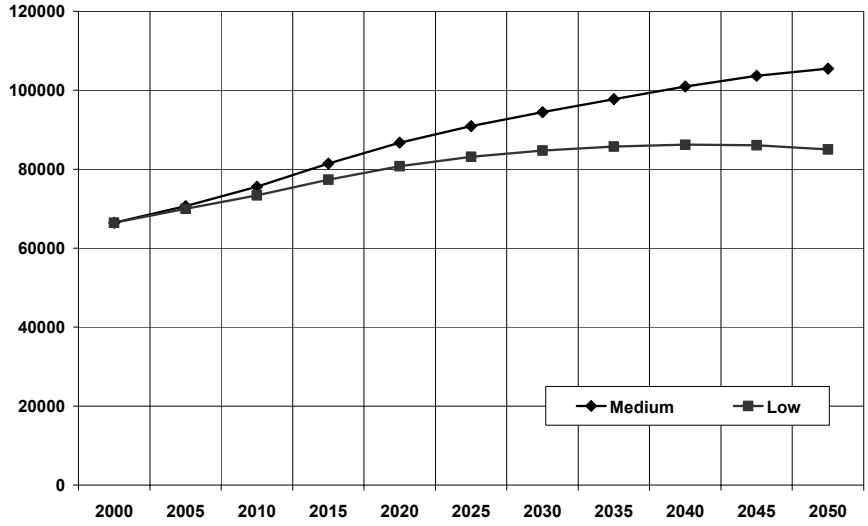
be 68.4 million. Using this estimate as a basis, the population of Iran was projected to rise to 76.2 million by 2000 and to continue its upward course until 2050. Its final size in 2050 was expected to lie between 143.8 (according to the low variant) and 199.6 million (according to the high variant), with a medium variant figure of 170.3 million. The constant-fertility variant predicted an even higher figure of 414.2 million.

These figures have been drastically scaled down in the United Nations 2002 revision. Nevertheless, figures obtained by the latter are still higher than those obtained by the US Census Bureau (2000) as well as projections made by the Manpower Bureau of the Management and Plan Organization of Iran (1997). The latter cover the period between 2000 and 2020 only. On the basis of recent evidence regarding the continuing fertility decline, the more modest figures obtained by Iranian authorities and the US Census Bureau would seem to be more realistic. Our guess is that the reality will lie somewhere between the low and medium variants of the UN projections, not too far from the single-variant projection published by the US Census Bureau. Because of this uncertainty, we will often refer to both the medium and low variants of UN projections.

### *7.1. Population Size*

All variants of the 2002 revision of the UN projections assume a population size of 66.4 million for the base year, 2000. All of them indicate a relatively sharp rise in population size between 2000-2020. The size attained at this point varies from 80.8 million (low variant) to 92.2 million (high variant). From this point on, the medium and low variants indicate a decrease in the tempo of population growth. This is particularly noticeable in the case of the low variant projection which would seem to have reached a plateau by 2025. As a result, there is only a small increase in the population size between 2025 (83.2 m) and 2050 (85.0 m). According to the medium variant projection, the population size will continue to rise so that its final value in 2050 (105.5 m) is almost 20 million higher than the value attained in 2020 (86.7 m) (Figure 10).

Figure 10
Population of Iran, 2000-2050, according to low and medium variant projections of the UN Population Division (2002 Revision)

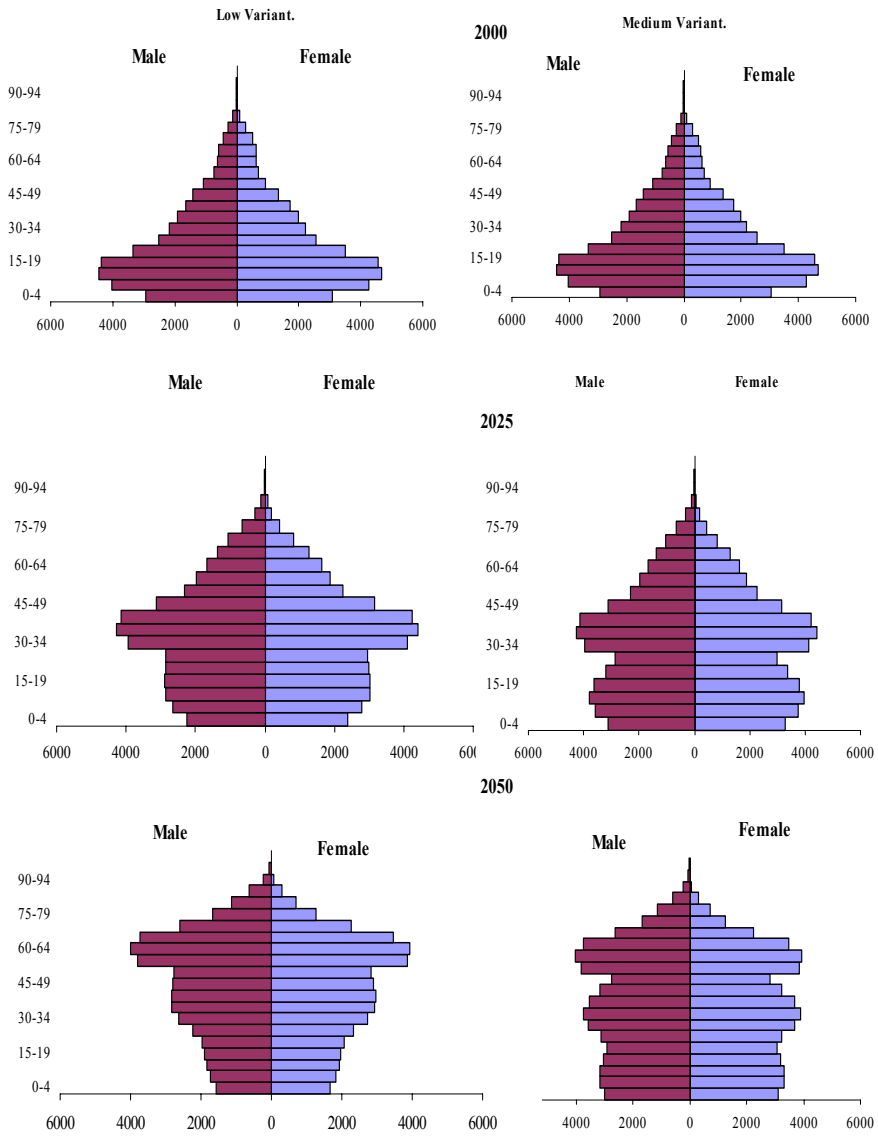



### *7.2. Overall Age Structure*

The low and medium variant age pyramids of the population for the years 2000, 2025 and 2050 are presented below (Figure 11). They clearly show the vast changes that the population of Iran will undergo during its passage from the beginning to the end of the observation period. From the pyramid for 2000 it would appear that the process of fertility decline initiated between 1990-1995 has continued over the next five-year period. The bulges facing age groups 10-14 and 15-19 are reminders of the high fertility experienced during the 1980s.

By the year 2025 the pyramids will have taken quite a different shape. The smaller and more or less equal cohorts born after 2000 will have given the bottom of the pyramid a rectangular shape. There are interesting differences between pyramids based on the low- and medium-level projections in this respect. The small bulge between age groups 10-14 and 20-24 in the medium variant pyramid, which is indicative of the momentum effect operating between 2005-2020, is almost entirely absent in the low variant pyramid. This means that sustained low fertility may prevent (or at least overshadow) the mo-

Figure 11
Age pyramids of the population of Iran in 2000, 2025 and 2050
(according to United Nations low and medium variant projections)

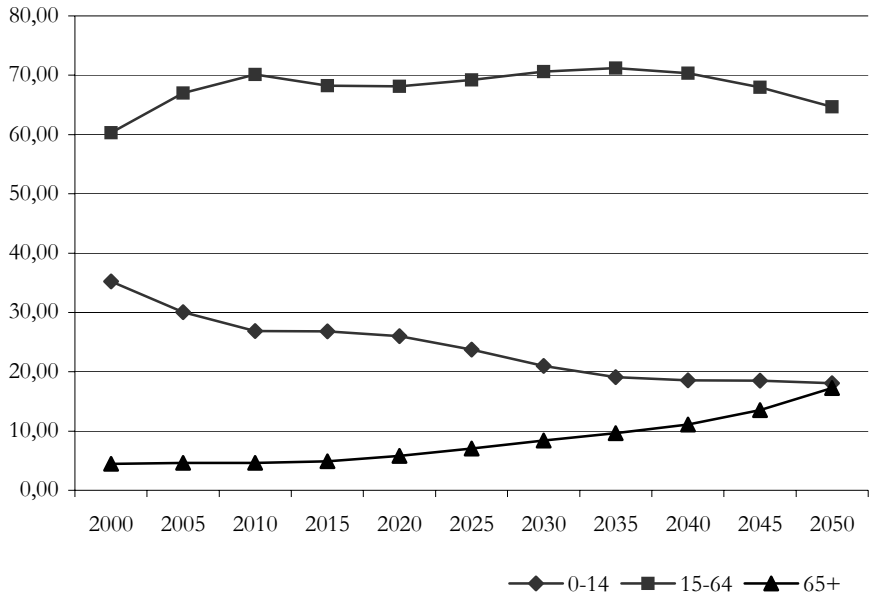


mentum effect. The shrunken rectangles representing age groups 0-4 and 5-9 are indicative of the second phase of fertility decline in both variants. From the pyramid for 2050 it is obvious that while the age structure of the population represented by the low variant projection has continued its downward move in a consistent manner, that of the medium level projection has continued to experience changes in relative size of consequent age groups as a result of both primary and secondary momentum effects (defined in Chapter 1 in this book).

### *7.3. Main Age Groups*

The size of the three main age groups 0-14, 15-64 and 65+ during the period of observation varies according to the variant considered. All three variants, however, indicate a progressive decline in the share of the youngest age group between 2000-2050 and a consistent increase in the number and ratio of the young adult and elderly groups (Figure 12).

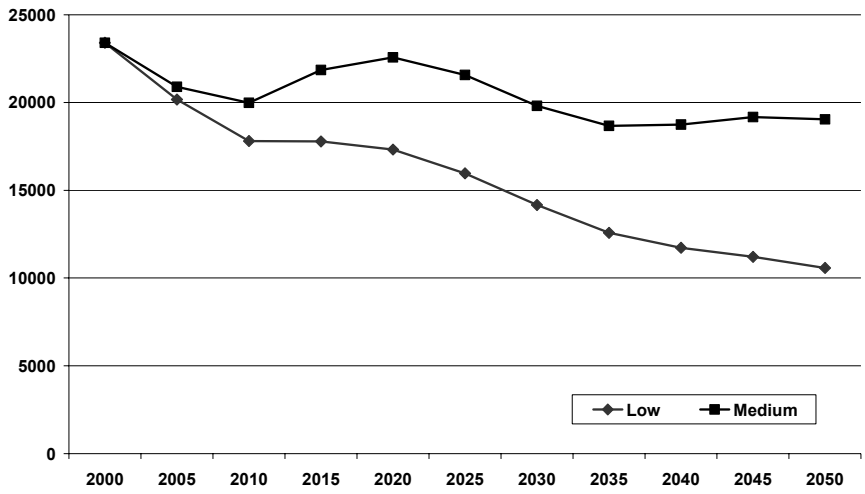
Figure 12
Share (%) of the three main age groups of the projected population of Iran, 2000-2050 (UN Medium Scenario)



### *7.4. Projected Size of Children Aged 0-14*

The projected size of the child population aged 0-14 between 2000-2050 varies according to the scenario used. All three variants predict a fall in the size of this age group between 2000-2010, but this is particularly marked and steep in the case of the low variant projection. The downward trend continues at a slower rate over the next decades so that the number at the age group in 2040 (11.7 m) is less than one half of the initial figure (23.4 m). In contrast, the medium level scenario predicts a slower decline in the number of children aged 0-14 between 2000-2010, a rise to almost the initial value between 2010-2020, a slow but consistent drop over the next 15 years, and very little or no change during the remaining decades. The number of children aged 0-14 in the year 2050 is projected to be 19.4 million, which is 81.4% of the figure for 2000. The momentum effect that is expected to raise the number of children aged 0-14 between 2010-2020, is totally absent in the case of the low variant projection (Figure 13).

Figure 13
Number of children (in 1000s) aged 0-14
according to UN's low and medium projections between 2000-2050



There are several reasons to surmise that momentum effects may, in fact, be much less marked than anticipated in the medium and high scenarios. On the one hand, the huge crop of children born during the baby boom period of 1976-1991 have had much better education than their parents. Almost all of them are literate and a good proportion have gone through secondary school or university. They have also been brought up in increasingly urban and media-exposed communities where family planning and contraceptive use have become a highly visible and socially reinforced norm. The upward trend in age of marriage noticeable since 1986 along with expanding opportunities for secondary and higher education for women, and the much higher labour-force participation rate of the better educated women, also mean that the baby boomers are more likely than their parents to view late marriage and small family size as normal if not highly desirable.

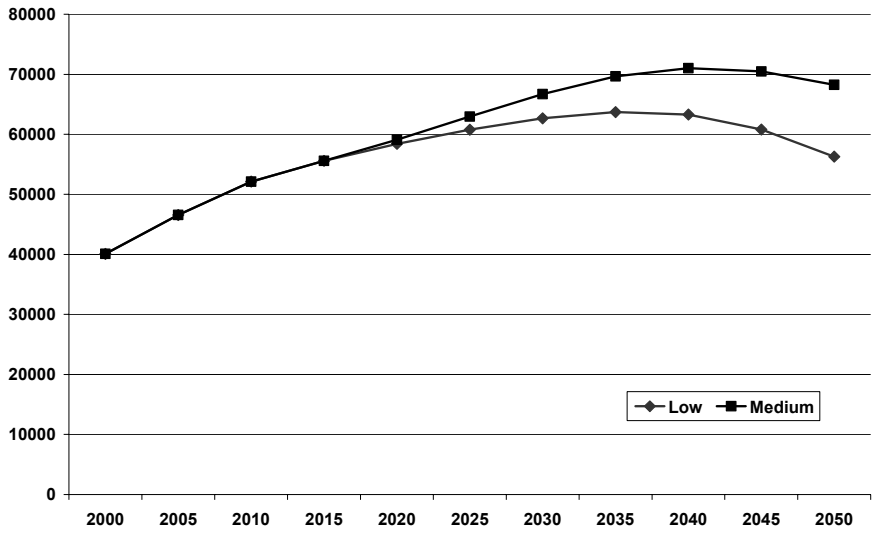
Considering the age group 15-19 as part of the child dependent group, it would appear that the downward trend in fertility during the 1990s has resulted in a drastic reduction of the number of children and adolescents aged 0-19. The trend is expected to continue until 2015 when the number of this age group will fall to 27.7 million (as compared with 30,841,092 in 1996 and 32.36 million in 2000). Due to secondary momentum effects, the numbers at young ages are expected to rise a bit (to 29.2 million) between 2015 and 2020, stay at that level until 2025 and take a downward turn thereafter, which will not stop until 2040. At this point the size of the group aged under 20 will be about 25.1 million, and thanks to minor changes in fertility during earlier decades will remain at around the same level until the end of the period of observation. This is only about 40% of the number for the same age group in 1996. By this time less than 25% of the population will belong to this young dependent age group. The corresponding figure for 1996 was 68%.

The expected fall in the number of children aged 0-4 years will have several important consequences. In the first place, it will lead to a decline in the number of children requiring health services, food and pre-school care. Secondly, there will be a sharp drop in the number of consecutive cohorts reaching age of formal schooling and thus a much reduced pressure on the school system. As these smaller birth cohorts move along time, the reduced pressure will be felt by different levels of the educational system.

### *7.5. Working-Age Population (15-64)*

According to all scenarios, Iran starts the 21st century with a working-age population of just over 40 million (or 60.3% of the population). The number rises swiftly according to all scenarios to exceed 52 million by 2010, 55.5 million by 2015, and to approach 60 million by 2020. From this point on the two variants differ in the figures they obtain. Taking the medium level projection, the upward trend continues straight until 2040 when the number of people aged 15-64 will exceed 71 million (Figure 14).

Figure 14
Number of people aged 15-64 years (in 1000s) between 2000-2050, according to UN's (2002) medium and low variant projections for Iran




The following decade will witness a slight drop in the number of this age group and by 2050 there will be 68.3 million people aged 15-64. According to this projection, at its highest level in 2040 Iran's potentially active and productive population will account for 71% of its total population. By 2050 the ratio will have dropped back to 64.7%. If one considers the share of the working-age population as the main

indicator of a demographic window of opportunity, it may be said that Iran will see this widen between 2000 and 2040, and that this will be particularly noticeable between 2010 and 2035.

Of the subgroups making up the working-age adult population, youth (ages 15-29) and women of reproductive age (15-49) deserve special attention. The semi-dependent youth aged 20-29 are projected to number 11.9 million at the beginning of the period. This high figure is a reminder of the relatively high fertility rate that prevailed between 1970-1980. As the birth cohorts of the first decade after the Revolution reach ages 20-29 the size of this group will go up to 15.4 million and 17.4 million by 2005 and 2010, respectively. It will decline slightly in 2015 (16.9 million) and go down more precipitously over the next decade to reach its lowest level (12.4 million) by 2025. It will go up again to attain a new height (15.1 million) in 2040, remain at the same level for another five years and go back down to its 2005 level by 2025.

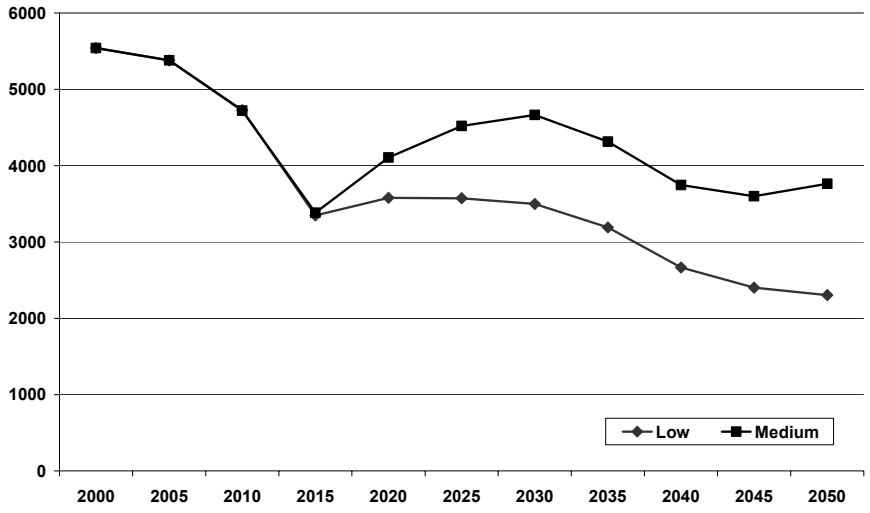
The high and fluctuating number of youth aged 20-29 will present services relating to higher education, on-the-job training, and employment creation with enormous challenges. There will also be a high and fluctuating demand for housing by the youth getting married. With a continuing rise in age at first marriage and an increasing number of unmarried, mostly well educated and western oriented urban men and women, the country is likely to face new challenges in the area of living arrangements and sexual relations. A rise in premarital and extramarital interactions, already viewed with increasing concern by Iranian parents and authorities, is likely to lead to social problems such as a rise in illegitimate births, abortions, STDs and HIV/AIDS.

### 7.5.1. Adolescents in Need of Secondary Education (Ages 15-17)

Both scenarios indicate a slight decline (from 5.54 to 5.38 million) in the size of this age group between 2000-2005 followed by a sharper decrease (to 4.72 million) between 2005-2010 and a much more precipitous drop (to 3.3 million) between 2010-2015. Between 2020-2030, the medium variant projection indicates a gradual rise to stop at 4.66 million in 2030 followed by a steady decline to reach 3.74 million by 2040 and vacillations around that figure until the end of the observation period. According to the low variant projection, however, the number of youngsters eligible for senior secondary education will vacillate between 3.58 and 3.49 million between 2020-2030 and will take a

downward trend to reach around 2.3 million by 2050. The number of youngsters eligible for senior secondary schooling during the last 10 years of the period will be 1.2 to 2.5 million smaller than the figure for 2000 (Figure 15).

Figure 15
Number of adolescents aged 15-17 years (in millions) between 2000-2050, according to UN's (2002) medium and low variant projections for Iran

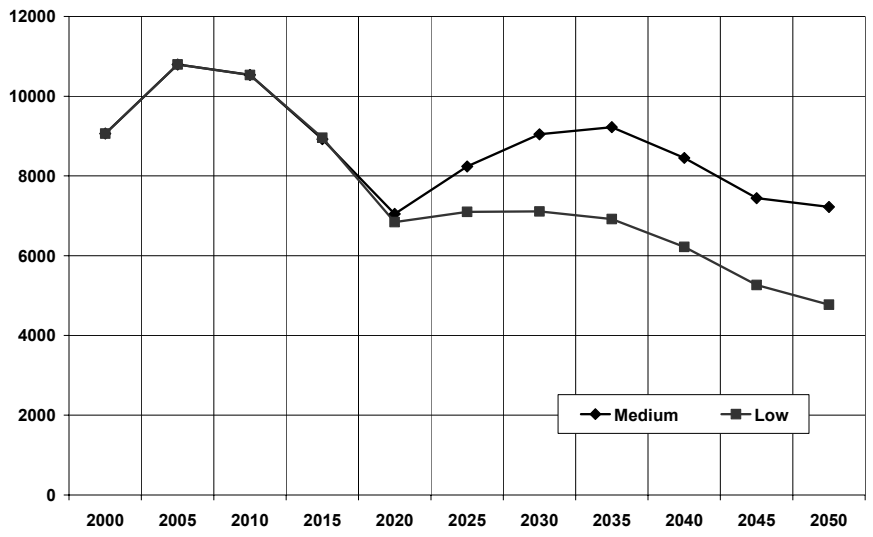



Of adolescents aged 15-17 almost three quarters are currently attending secondary school and Iranian authorities are planning to extend the age of compulsory education to cover all of this age group. Given the increasing demand for more complex social and vocational skills, Iran can hardly expect to compete in a rapidly globalizing market if it allows its youth to leave school at age 14. At the same time the curriculum of the existing secondary education, which is mainly designed to prepare youngsters to enter universities, may need radical changes to enable them to train the kind of middle-level technical manpower needed by modern employment markets. Much more emphasis will have to be put on computer literacy, information technology and foreign languages.

7.5.2. Youth Eligible for Higher Education (Ages 18-23)

According to both projections the number of young people eligible for higher education will rise by over one million between 2000-2005 to fall only slightly (by 20,000 or so) over the next five years (Figure 16). According to both projections, there will be a consistent and sharp decline (amounting to about three million) over the period 2010-2020. The medium variant projection predicts a gradual rise between 2020-2035 followed by an equally gradual decline over the next 15 years. The number of potential university applicants during the final decade of the period of observation is estimated to be between 7.2 and 7.4 million according to the medium and between 5.26 and 4.77 million according to the low projection, that is 1.8 to 4.3 million less than the figure for 2000. If Iran intends to enter the club of manufacturers of new knowledge and technology, it will have to invest substantially in improving the quality of its higher education and in creating opportunities for postgraduate, doctoral and post-doctoral studies for increasing proportions of those aged 25-29.

Figure 16
Number of people aged 18-23 years (in 1000s) between 2000-2050, according to UN's (2002) medium and low variant projections for Iran



The large group of better educated, occupationally ambitious, socially dissatisfied, unmarried and sexually frustrated youth concentrating in the higher education institutions of large urban centres will also constitute an extremely important and sensitive group. This is the age group that was in the forefront of political demonstrations that resulted in the unexpectedly quick victory of the Islamic Revolution in 1979. The same age group, particularly women, are known to have played a major role in the victory of the reformist movement represented by president Khatami in the late 1990s. If not correctly handled, their enormous energy and enthusiasm may confront Iran with huge social and political problems over the first half of the 21st century. It may be of some interest to note that the minimum age of voting (15 years) is quite low in Iran.

### 7.5.3. Young Adults

The adult group aged 30-59 will experience more continuous and more profound growth than all other groups. Starting with the modest figure of 17.9 million (just over a quarter of the projected population) in 2000, the size of this group will follow a steady upward trend until 2040, although its tempo of growth will decline gradually after 2025. Initially, the number of adults is smaller than that of children aged 0-19. By 2015 it will be the largest of the five age groups. By 2035 it will surpass the combined number of children and youth and retain this advantage until the end of the observation period. Thus one may consider the year 2015 as the real date for the full emergence of the window of opportunity in Iran and the period between 2025-2040 as the period during which the window will be fully open for exploitation. After this date the window may be gradually narrowed by the entry of an increasingly larger number of people aged 65+. The latter group is projected to attain critical dimensions between 2035-2040 when Iran will be facing the enormously complex demands of over four million people aged 75+ suffering from all the social, medical and financial problems that currently bother this age group in developed countries.

### 7.5.4. Women at Reproductive Ages (15-49 Years)

As the members of this age group were born 15-49 years before the onset of the 21st century, their number is bound to increase as the

larger birth cohorts of the 1970-1990 period go through their reproductive period. This is reflected in all variants of projections which indicate a sharp rise between 2000-2010 (from 17.4 million to 22.9 million) followed by a less marked increase over the period 2010-2020. At this point the medium and low variant projections depart from the high and constant fertility scenarios.

According to the medium variant projection, the slow upward trend continues until 2030 and takes a slow downward turn ending in 2045 when it will begin a very slight upward trend again. The number of women of reproductive age projected for the final decade of the observation period is about 23 million, that is almost 4.7 million larger than its initial value, but 2.5 million smaller than the peak value (25.7 million) attained in 2030.

This broad age group is clearly one of the few major age groups that will not shrink much during the first half of the century. The health and reproductive health needs of this important group will have to be considered as a priority area in planning health services. It goes without saying that proper attention to the reproductive health needs of these women (as well as their male counterparts) will play a major role in not only shaping the health status of Iranian people as a whole but will also go a long way in producing conditions needed for further fertility control and age-structural transition.

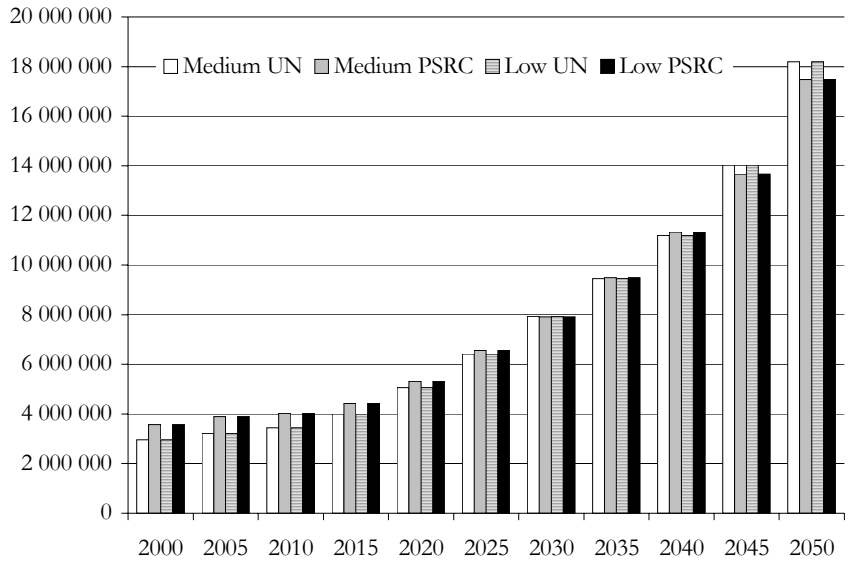
### *7.6. The Elderly (Group Aged 65 and Over)*

All variants begin with the same number of elderly (2.962 million) which grows at a very low rate to reach four million by 2015. As the members of this age group belong to birth cohorts born during the second half of the 20$^{th}$ century, its size is not affected by the different fertility (and life expectancy) assumptions underlying different scenarios. As a result, all four variants produce the same numbers. There is a rise in the rate of growth of the elderly after 2015 so that its size doubles between 2015-2030, exceeds 11 million by 2040 and stands at 18.2 million by the end of the period. This means that while the total size of the population of Iran will fail to double during the fifty-year period of observation, the number of elderly aged 65 years and over will experience a six-fold increase (Figure 17).

In relative terms, the share of the elderly in the total population will rise from just over 4% in the year 2000 to over 25% by the low

variant and about 20% by the medium variant projection by 2050. Of the elderly population living in 2050, about one third (6.1 m) will be aged 75+. Of the latter group 4.8 million will be aged 75-84 and 1.3 million 85+ years. In other words, by 2050, Iran will have to cater for 3.2 million people aged 80+ which is larger than the total number of people aged 65 and over (3.0 million) in the year 2000. The impact of this huge group of dependent elderly on the social security and pension system of Iran deserves careful analysis. As people reaching the age of retirement over the next few decades will all have been born during the 20th century, their number is subject to little uncertainty and is unlikely to change significantly. Nor can the enormous problems of coping with an aged population that will amount to almost one fifth of the total population be ignored.

Figure 17
Population aged 65+ years, low and medium variant projections of UN and PSRC

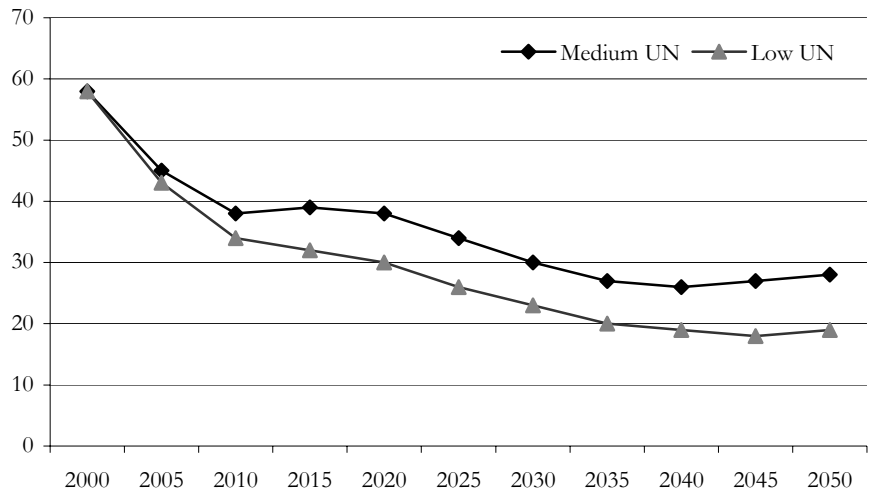



### *7.7. Changes in Dependency Ratios*

All four UN projections assume a total dependency ratio of 66% for the year 2000. This is exactly the figure given by the DHS-type

survey carried out in October 2000. All four projections also assume a sharp drop in the dependency ratio between 2000-2010. The drop is sharper for the medium and low variant projections. According to the medium variant projection, the dependency ratio will take a mild upward swing between 2010-2020, but will go down again between 2020-2035 when it attains its lowest projected value of 40%. It will rise again between 2035-2050 and stand at 55% by the end of the period of observation. The sharp decline in the dependency ratio between 2000-2010 is mainly due to the significant drop in the number of children aged 0-14 (Figure 18). According to the medium variant scenario, the child dependency ratio will fall from 58% to 38% between 2000-2010, remain at that level until 2020, fall further (to 26%) and rise only slightly to attain its final value of 28% by 2050.

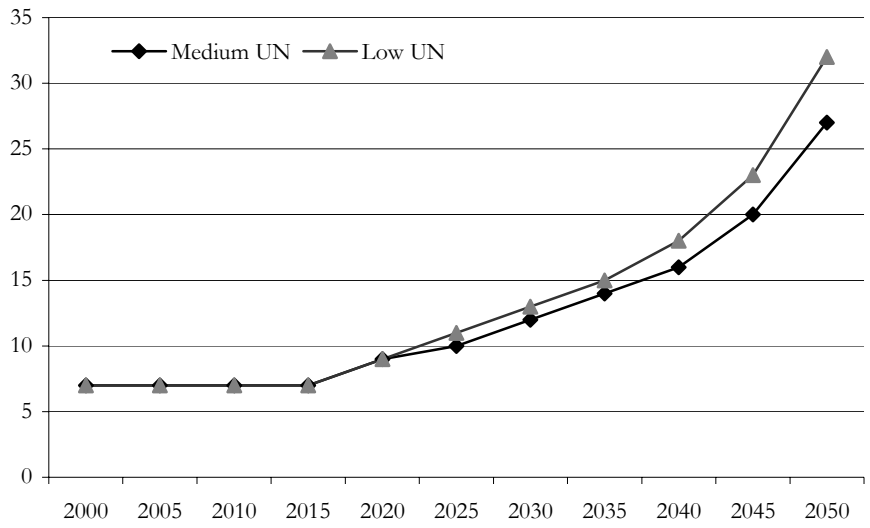
Figure 18
Child dependency ratios, UN's low and medium variant projections (2002)




In contrast, the elderly dependency ratio is expected to rise and constitute a larger share of the total dependency ratio (Figure 19). According to all four variants, the elderly dependency ratio, which is assumed to have been seven per cent in 2000, will remain at the same level until 2015. After this date, all variants predict a relatively sharp upward swing in the elderly dependency ratio. According to the me-

dium variant projection, the elderly dependency ratio will rise steadily between 2015-2035 when its size will be exactly double the figure for the initial year. It will undergo an even sharper upward change in 2040 to reach the figure of 27% by the end of the period.

Figure 19
Elderly dependency ratios, UN's low and medium variant projections (2002)




Due to age differences between husbands and wives and the longer life expectancy of women, the elderly group will include a disproportionately large number of women who are more likely to have been "housewives" without their own income or pension scheme. The "oldest of the old" group is particularly likely to consist of widowed women living on their own. With the gradual disappearance of the traditional family structure and the inability or reluctance of children to look after their parents, this group will need special care in terms of financial support, health services, social relations or some form of homecare. Their increasing number is already being felt by Iran's fledgling social security system whose extension and sustainability has become a matter of national debate and concern.

## 8. Consequences of AST with Regard to the Millennium Development Goals (MDGs)

Iran was among the member states of the United Nations which endorsed the set of eight broad goals and 18 specific targets to be achieved by 2015. All these goals and targets aim at improving the living conditions of people and are in turn affected by the future size and age structure of the population. Iran's tremendous success in checking its high population growth rate within a surprisingly short time has in fact enabled her to invest resources in improving the health, education and social status of the Iranian people. Many of the goals mentioned in the MDG list are already achieved. Almost all children now have access to public primary education. The literacy rate of people aged 6-24 had risen to above 95% in 2003. There was almost no gender disparity in access to primary and secondary education. Over the past few years, the number of women sitting for university entrance examinations and passing them has surpassed that of men. Neonatal, infant, and under-five mortality rates have been reduced significantly since the 1990s, as have maternal mortality ratios. More important, the traditional gap between urban and rural areas in terms of infant and maternal mortality and most other health indicators have been considerably narrowed (Mehryar *et al.* 2003).

In the area of environmental sustainability, however, Iran's achievements have been less remarkable. In fact, due to an abundance of oil resources and underdeveloped technology, Iran's per capita energy consumption and CO2 production exceed those of most other countries. The overwhelming majority of people in both rural and urban areas have, however, access to safe drinking water, electricity and mass media (United Nations 2003c). Iran has also taken great strides in combating and controlling traditional communicable diseases, including malaria. As a result, the morbidity and mortality patterns have changed enormously and problems arising from life styles and individual behaviours have emerged as the main causes of mortality (MOHME 2001; Naghavi 2003). The HIV/AIDS epidemic still remains limited to certain high-risk groups, particularly injecting drug users. There are, however, indications that the pattern of HIV transmission may be changing to involve heterosexual as well as homosexual relations and Iranian authorities have recently taken a more open and realistic approach to this problem.

The sustainability of these achievements will heavily depend on economic growth over the next decades. If the economy grows there will be more resources for investment in further improvement of the progress made in most of the MDGs. This is particularly true of goals dealing with poverty reduction and job creation. As the dependency ratio of children will continue to fall and there will not be much increase in the dependency ratio of the elderly between 2000-2015, Iran will be in a demographically advantageous period. Judicious investment of resources that are likely to be saved due to the continuing fall in the number of children in human-capital development and renovation of the industrial infrastructure will be essential for the efficient use of the window of opportunity facing Iran.

## 9. Discussion and Conclusions

The evidence reviewed above leaves no doubt that, following the drastic changes in social values and political orientation ushered in by the Islamic Revolution, Iran experienced a tremendous change in its fertility and population growth rate. The turbulence was however of short duration and by the late 1980s there were clear signs of decline in fertility rates, particularly in urban areas. The downward trend was immensely helped by a change in government's population policy and the revival of the family planning program. The national census of population conducted in 1996 provided more convincing evidence of a drastic fall in fertility in both urban and rural areas. Large-scale surveys conducted since then leave no doubt that the contraceptive prevalence rate of Iranian couples has risen to surprisingly high levels and fertility rate has continued its sharp downward trend with little evidence of fluctuations seen in such other countries as China and Romania. Thus Iran would seem to confront only one major wave represented by the cohort born between 1976-1989. In fact, the number of births officially registered in 1992 was almost equal to the number registered in 1977. By 1995 the number had fallen below that for 1974.

Having successfully managed to control an upward swing in fertility, Iran has entered a definite period of age-structural transition since 1996 which will continue through the first half of the 21st century. As a result of this transition, the ratio of children in the total population has

dropped significantly while that of the elderly is just rising above five per cent. There are clear signs of a widening window of opportunity.

The wave set in motion by the huge number of children born between 1976-1991 will, however, continue to confront Iran with serious problems during the first decade of the century. These will be mainly in the areas of job creation and employment. As the cohort of young men and women born during that period enters its family-building and reproductive careers, the country will be faced with problems of housing and probably a new wave of baby boom. The increasing number of people going through their most active and productive period of life (ages 25-59 years) will present a unique opportunity for growth, savings and investment.

If the window of opportunity is taken seriously and made good use of, Iran will be in a much better position to respond to the enormous challenges that will be posed by the large number of elderly that will have to be taken care of in 2040s. In this regard, Iran has to realize that women comprise almost half of the potentially productive age groups and their absence from the labour force can undermine all efforts to speed up and maintain the rate of economic growth needed. The fact that the majority of the elderly demanding care and services in the 2040s will also be women makes investment in women's labour-force participation and coverage by the social insurance system all the more important.

The transition may prove less smooth and more problem-ridden than described above. The gains coming from the demographic bonus during the first quarter of the century (2000-2025) may not suffice to outweigh the effects of turbulence. Certain policies may prove more resistant to change and require a longer period of preparation than others. With the marked reduction in fertility and the number of children a large number of primary and secondary schools may have to be closed down. But the savings expected may not accrue easily because of the need for keeping teachers employed. The public education system is the largest public employment sector and a large proportion of youth coming out of the higher education system depend on this sector for employment. This is particularly true of women who have outnumbered men in university entrance examinations since the late 1990s. For many of them employment by other agencies, even if available, may not be socially correct or acceptable. This may radically diminish the expected gains from an increase in the proportion of young

adults by keeping women's participation in the modern formal sector of the economy at its currently low level.

There is also the possibility that the sharp downward trend of fertility continues and drops below replacement level. This has already been experienced by urban populations in a number of better developed provinces. Several large scale surveys conducted between 2000-2004 indicate that the downward trend initiated in the mid 1990s is still continuing. According to the latest survey carried out in May 2004 (SCI 2004b) the share of children aged 0-14 had dropped to 27.1% (as compared with 45.5% in 1986 and 34.5% in 2000). Such a trend is likely to further decrease child dependency ratios and make the window of opportunity wider. But the small number of children reaching the age of labour-force participation and economic production may prove incapable of raising national productivity and wealth to levels required by the huge increase in old-age dependency after 2035. There are signs that due to forced expansion of social security benefits to a large group of workers who have either paid little contribution or retired at an early age, the social security system is rapidly loosing its funds and will have to adopt a pay-as-you-go policy in a near future. A marked reduction in the number of young workers entering the system is bound to affect the survival of a pay-as-you-go system. Under the circumstances the younger generation may also feel at a disadvantage in intergenerational struggle for creation and use of resources.

**References**

ABBASI, M J, MEHRYAR, A, JONES, G and MCDONALD, P (2002) "Revolution, War and Modernization: Population Policy and Fertility Change in Iran", *Journal of Population Research*, 19(1): 25-46.

AGHAJANIAN, A (1991) "Population Change in Iran, 1966-86: A Stalled Demographic Transition?", *Population and Development Review*, 17: 703-715.

AGHAJANIAN, A and MEHRYAR, A H (1999) "Fertility Transition in the Islamic Republic of Iran, 1976-1996", *Asian-Pacific Population Journal,* 14(1): 21-42.

BLOOM, D E, CANNING, D and SEVILLA, J (2002) *Demographic Change and Economic Growth: The Importance of Age Structure*, Santa Monica, Ca.: RAND Corporation.

CASSEN, R (1994) *Population and Development: Old Debates, New Conclusions*, New Brunswick, New Jersey, and Oxford: Transaction Publishers.

COALE, A and HOOVER, E (1958) *Population Growth and Economic Development in Low-Income Countries*, Princeton, NJ, Princeton University Press.

COWGILL, D O and HOLMES, L (1970) "The Demography of Ageing", in Hoffman, A M (ed) *The Daily Needs and Interests of Older People*, Springfield, MA: Charles and Thomas.

KEYFITZ, N (1977) *Applied Mathematical Demography*, New York: Wiley.

MEHRYAR, A H, ed (2001) *Proceedings of the First International Workshop on the Integrated Approach to Reproductive Health and Family Planning in the Islamic Republic of Iran, Isfahahn, 31 April-13 May 2000*, Tehran: Institute for Research on Planning and Development.

MEHRYAR, A H (2002) *Demographic and Health Survey of Iran: A Summary of Main Findings*, Tehran: Population Studies and Research Centre Working Paper Series in English.

MEHRYAR, A H, AGHAJANIAN, A, AHMAD-NIA, S and SHADPOUR, K (2003) *Primary Health Care and Rural Poor in the Islamic Republic of Iran*, Tehran: Population Studies and Research Centre Working Paper Series in English.

MOHME (MINISTRY OF HEALTH AND MEDICAL EDUCATION) (2001) *Preliminary Report on the Iran DHS Survey, 2000*, Tehran: Statistics Unit, Office of the Undersecretary for Public Health, Ministry of Health and Medical Education (mimeographed monograph in Persian).

NAGHAVI, Mohsen (2003) *A profile of Mortality in 18 Provinces [of Iran]*, Tehran: Tandis Publications (in Farsi).

SCI (STATISTICAL CENTRE OF IRAN) (2002) *Statistical Yearbook of Iran, 1381*, Tehran: SCI Publications.

SCI (STATISTICAL CENTRE OF IRAN) (2004a) *Household Survey on the Characteristics of Employment and Unemployment (Winter 1382)*, Tehran: SCI Publications (in Farsi).

SCI (STATISTICAL CENTRE OF IRAN) (2004b) *Household Survey on the Characteristics of Employment and Unemployment (Spring 1383)*, Tehran: SCI Publications (in Farsi).

UNITED NATIONS (2002) *World Population Prospects: The 2000 Revision*, New York: UN Population Division. Available on-line at: http://www.un.org/esa/population/ publications/wpp2000. pdf

UNITED NATIONS (2003a) *World Population Prospects: The 2002 Revision*, New York: UN Population Division. Available on-line at: http://www.un.org/esa/population/ publications/wpp2002/WPP2002-HIGHLIGHTSrev1.PDF

UNITED NATIONS (2003b) *World Population Prospects: The 2002 Revision. Population Database*, New York, UN Population Division. Available on-line at: http://esa.un.org/ unpp/.

UNITED NATIONS (2003c) *Common Country Assessment for the Islamic Republic of Iran (CCA/IRI)*, Tehran: UNDP.

UNITED NATIONS (2004a) *United Nations Development Assistance Framework for the Islamic Republic of Iran (2005-2009)*, Tehran: UNDP.

UNITED NATIONS (2004b) *Millennium Development Goals [for the Islamic Republic of Iran]: Empowerment and Participation*, Tehran: UNDP.

# *Part IV*

# *CATCHING THE WAVE OR MISSING IT*

# 13

# POLICY IMPLICATIONS OF AGE-STRUCTURAL CHANGES[1]

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**Ian POOL**

***Abstract***

This chapter synthesises the rest of the book. It identifies an emerging trend from growth to structural shifts as a demographic driver. It defines one of these, age-structural transitions (ASTs), and shows their policy implications, in particular for the Millennium Development Goals (MDGs). It shows how, appropriately exploited, the ASTs could provide a "Window of Opportunity" for the implementation of the MDGs. Finally, it links the ASTs to other demographic and social transitional models.

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1. This chapter was originally published as a Policy Paper that summarised key issues emerging from the discussions at the Workshop. See Adioetomo *et al.* (2005), *Policy Implications of Age-Structural Changes*, CICRED Policy Paper no. 1, Paris, CICRED.
2. UNFPA, New York, USA.

## 1. Age-Structural Transitions, a Major Twenty-First Century Population and Development Issue: A Bonus or a Lost Opportunity?

The World Community has recently passed through a crisis of very rapid population growth that resulted from very high fertility occurring at a time when mortality had declined radically. But, as a result of the concerted action of countries across the globe, of international agencies and of civil society in general, fertility has generally declined dramatically and growth has slowed. This, however, has produced age-structural transitions (ASTs) that are unprecedented in terms of their speed and their policy implication.

Thus, a new issue has emerged, and it requires equally concerted action. For most countries, the demographic changes involved could be seen as a "Demographic Bonus",[3] because the balance between dependent and working-age populations has shifted significantly while ageing is still some way off. Because of this shift in balance, there are more people in the working-age groups than in the dependent age groups. But, as this paper will show, a failure to invest in key mechanisms, a number of which are explicit or implicit in the Millennium Development Goals (MDGs), could mean that the bonus would instead become another demographic crisis that would minimize the chances of attaining sustainable development. This paper therefore calls the favourable shifts in dependency ratio a "Window of Opportunity" rather than a "Demographic Bonus". The central point is that, managed well,[4] the new trends could enhance sustainable development; managed badly, they will limit significantly the possibilities for sustainable development.[5] This is the central demographic challenge for development, and is as critical, perhaps even more so, as rapid population growth was a decade or so ago.

This trend (favourable shifts in dependency ratio) results then, primarily from ASTs generated by rapid declines in fertility, and in

3. A very succinct and easily read introduction to this issue is in Bloom *et al.* 2003.

4. As seems to have been the case in some Asian economies. E.g., see Higgins and Williamson (1997). In contrast, Cornelia Muresan in her paper here (Chapter 10) is pessimistic about the possibility of this occurring in the same way in Romania.

5. Defined here as including sustained social and economic development that is environmentally sustainable.

many countries, from factors such as high rates of immigration or emigration. Where survivorship is threatened by HIV/AIDS and other causes of mortality, this factor also plays a role.

## 2. What Is an Age-Structural Transition?

An Age-Structural Transition is the passage of a cohort from one age group to the next one, for example, 0-4 to 5-9, etc., years of age, or from one life-cycle phase to another, from, say, childhood to youth. This is, of course, a normal phenomenon, but is one that in the 21st century is becoming of increasing importance as growth through natural increase slows, and as compositional changes such as age-structural transitions become increasingly important factors of demographic change.

Age-structural transitions take several forms. Firstly, momentum effects (defined below) will produce rapid growth even after fertility has declined to low levels – in Chapter One, this was called "primary momentum". Secondly, the large birth cohorts (generations) of the past when fertility was still high, will become large parental cohorts, and thus produce many births even after fertility rates have dropped to low levels – Chapter One referred to this as "secondary momentum".[6] Thirdly, the AST will normally involve the passage of a "Population Wave" across each life-cycle stage, producing peak pressure on needs and services that are appropriate to these stages (e.g., education for the young; employment for youth; etc.). Fourthly, in many countries,[7] these waves are very irregular (technically termed "disordered cohort effects"), a phenomenon that will make the achievement of planning and policy formulation very difficult. C. Muresan reminds us in her chapter that these effects do not miraculously finish at age 65 years, but continue affecting the balance between age groups at these ages. This has

6. The effects of this are seen in Chapter 12 by Amir H. Mehryar and Shirin Ahmad-Nia ("Age-Structural Transition in Iran: Short- and Long-Term Consequences of Drastic Fertility Swings During the Final Decades of the Twentieth Century"). See especially Figure 11, 2025 medium variant.

7. Case studies for countries facing this problem are in chapters here by, e.g., Cornelia Muresan (Chapter 10: "Bonus ou malus démographique en Roumanie") and Yan Hao (Chapter 11: "Age-Structural Transitions: Major Policy Implications for China").

implications for policy as the needs of the oldest old are different from those of the younger elderly.

Methodologically, there are two major strategies for mapping ASTs. Both of them depart from conventional age-structural analyses that are based on cross-sectional measures, and thus that are very simple.[8] Both instead, look at flow effects as well as stocks. One uses broader age ranges and thus provides a longer-term generalized overview, that is particularly useful when projecting long-term trends in age structure and in co-variates for populations about to undergo, or currently undergoing an AST.[9] But this tends to dampen the wave effects, especially for those populations whose age structures are highly perturbed. This pattern of perturbation has major implications for policy (it demands on-/off-again policies). The other methodology concentrates on cohort flows using finer age groupings, but therefore lacks the broad overview provided by the first-noted method. Nevertheless, it must be stressed that the two methods are not competitive: they each provide information on a different aspect of the same phenomenon.[10]

One clarification is necessary: an AST involves changes at all ages, not just old ages. "Population Ageing" is merely one facet of an AST. When the percentage at old ages increases and aged dependency burdens go up, this is at the end-point of an AST, but prior to this, a population or a country will have faced age-structural challenges that may be more significant than the burdens associated with the aged population. Moreover, the aged population will need to be sustained by younger age groups, so that their characteristics are as critical to policies on ageing as the financial dimensions that occupy the foreground in public debates on positive ageing. This is, of course, particularly true in those societies that have not yet been able to develop comprehensive social security systems. Beyond this, ageing itself will seldom in-

8. See Shryock and Siegel (1976). This contrasts with the methodologies in mathematical theoretical demography, an application of which was made in the Seminar in a case study on Vietnam to show the effects of momentum (Dang Nguyen Anh, "Age-Structural Transitions: Analysis Using the Stationary Population Equivalent Model").

9. This point is illustrated in the paper here by Bo Malmberg and Thomas Lindh (Chapter 3: "Forecasting Global Income Growth Using Age-Structural Projections").

10. See Chapter 2 by Ian Pool. Laura Rodríguez Wong and José A. M. de Carvalho in their paper here (Chapter 7: "Age-Structural Transition in Brazil. Demographic Bonuses and Emerging Challenges") have used a version of these methods similar to that employed by I. Pool to provide a different graphical perspective.

volve a simple wave-like effect, but will see both waves and troughs pass across the younger and older, elderly population groups (say 60-79 years, and 80+). Amongst other things, this shift will have an impact on the balance between the different groups among the elderly.[11]

The word "ageing" is itself a confusing term as it means both the process by which an AST moves across life-cycle stages to produce an older population structure or increasingly higher numbers of people at these ages. But also, particularly in popular perceptions, it is used to describe a structure that has become "older". In this paper, ageing is used in its popular sense, while the process leading to this is called an AST.

## 3. Age-Structural Transitions: An Urgent and Important Issue

In the population and development debate, some of the attention has switched dramatically from the growth crisis and from issues such as reproductive choice, to the burdens of ageing. The discourse in civil society appears, however, to have vaulted completely across the intermediate stage that, in many countries, almost all in the South, will occupy the next few decades during which growth declines, and before ageing really sets in. In fact, in many countries, particularly in sub-Saharan Africa, ageing *per se* is a very distant phenomenon, yet is often perceived as something about to occur. Before then, African nations and most other countries have a window of opportunity that could be brought about by this demographic dividend/bonus, as child and total dependency, and as the costs associated with them, decline, but before aged dependency sets in. In contrast, a failure to realize this bonus could mean that these states could face unprecedented population crises, not due to growth, but to shifts in age composition.

This chapter directs its attention to the window of opportunity, emphasizing the policy implications of a massive demographic shift resulting from age-structural transitions mainly due to decreasing fertility and low mortality rates. It looks at what will eventuate "tomorrow", between now and 2015, in most countries (even the developed ones), and which will continue to be a major issue.

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11. This point is developed for New Zealand in Pool (2003). See also Muresan's chapter in this book.

By focussing on ASTs, analysts can also respond to another problem: that statistical relationships between population and development have often been difficult to demonstrate in a refined way. But the linkages become much clearer once attention shifts from population size and growth to ASTs.[12] There are two reasons for this. Firstly, as noted already, changes in composition occur over short durations during an AST, even for wider age ranges (e.g., 15-24 years), especially for more perturbed age distributions. These fluctuations produce rapid shifts in patterns and levels of demand and needs relevant to particular age groups, both in the public policy domain and for the market sectors, as peak numbers produced by large cohorts are then followed in rapid succession by reduced demands/needs as smaller cohorts reach the same life-cycle stage, that is, as a wave is followed by a trough. Driving this is the fact that both needs for public policy interventions and for market goods and services are highly age-specific. This takes one to the second and related point, that, as a consequence, economic and social sectors, in fact, most market and public policy sectors address the needs of particular age groups, a point that will be developed later.

Development policy and planning models are well adapted to respond to these conditions. This is because the time horizon of the planner is normally quite short, and thus is fitted well to endogenising into the models' shorter-term, age-compositional changes, but not so well to integrating long-term overall growth trends. And the sector-specific approach implied in this paper, with its linkages to age-specific trends identified here, suits the newer planning strategies that postdate the central planning era.

The issue of ASTs is, in fact, so urgent that it must be built into the discussions surrounding ICPD+10, if a global window of opportunity is not to be lost. The ICPD (1994) itself had afforded a unique opportunity to map ASTs and to formulate a response, for at that moment, almost 20 per cent of the world's entire population was at 15-24 years of age (see Chapter 2, Table 1), the age group with the highest "demographic density" (where all sorts of life-status changes are occurring: reaching physiological maturity; leaving school; entering the labour force; starting a family; migrating and joining the "floating

12. This point is developed in B. Malmberg and T. Lindh's chapter, using income as a reference factor. In this paper, though, the more general point relating to development overall is also developed. See also Bloom *et al.* (2003).

populations"; etc.).[13] It is this age that is most pivotal for exploiting the window of opportunity. But at Cairo, there were pressures of other sorts, in areas such as gender equality and reproductive choice, and on ageing (at a time when only six per cent of the world's population were aged), and thus due attention was not given to ASTs.

This window of opportunity cannot be allowed to pass by again. Fortunately, Cairo's Programme of Action does provide a blanket resolution that is apposite to this undertaking: "Countries should aim to meet the needs of youth, ensuring their integration and participation in all spheres of society" (paragraph 6.11). ICPD+10 could well lead off from this quite prescriptive starting point, and then elaborate on it. But as the youth wave of 1994 has now moved on to ages 25-34 years, any elaboration would also have to provide goals and recommendations appropriate to this latter age group.

As discussed below, population and development plans and actions will need to extend beyond issues such as family building into other social and economic demographic domains, and factors of population and environment. All regional efforts could be directed to these goals. Above all, they should become central components of the New Partnership for African Development initiatives.

## 4. An Inexorable Trend: Age-Structural Transitions

ASTs are underway. They cannot be stopped, even in the unlikely event that fertility were to rise again. Migration is sometimes seen as a mechanism for reducing distortions, but, as the United Nations Population Division has recently shown, such strategies are fraught with problems for countries/regions, both of origin and of destination.[14]

Thus, the waves are already making their way up the age pyramid, sequentially altering the proportion of the population at each life-cycle stage. An exception might be claimed for those sub-Saharan countries where fertility declines are not underway, or are as yet very slight. But this would be a misunderstanding, because change can occur numerically as well as proportionately: some African countries will see rapid

13. Outlined in Rindfuss (1991).
14. This issue is elaborated well in UN (2001).

numerical growth at each age group (e.g., see I. Pool's Chapter 2),[15] and thus are undergoing one form of AST. In fact, the ASTs of African countries, driven by accelerating primary and secondary momentum effects, are perhaps the most extreme anywhere.

## 5. Age-Structural Transitions and the Millennium Development Goals: A Crosscutting Issue

To provide a more concrete review of linkages between ASTs and sustainable development, it is useful to take as example development goals that have been formulated and which represent, as it were, a consensus across the international community and civil society. The Millennium Development Goals serve this purpose well.

ASTs constitute a crosscutting issue in that they place face-to-face population and development across every sector. It is obvious that population changes produce shifts in demands for goods and services, and that this will be most evident in the social sectors. But each of those sectors tends to address a different life-cycle stage – education for the young, employment for youth entering the job market, housing for people at family-building ages, health for the young and old, and support in income or services for the elderly. With an AST, this synergy becomes more problematic if waves then troughs produce peak demands that then fall off. Of course, sometimes this may then permit more accent to be placed on quality as against quantity. This demand effect translates across even into the infra-structural, financial and fiscal sectors: fiscal burdens, for example, will be very much affected by who at which age needs what, and fiscal capacity by who at which age can pay taxes; the provision of housing or institutions is very much affected by age-structural and family transitions.

ASTs also have supply-side effects, of which the supply of labour (or the over-/under-supply of labour) would be the most obvious. But one can add the supply of services (e.g., supply of teachers or nurses), and also of course, fiscal capacity (who pays the taxes; this is a factor not just of the "working ages" vs. "the dependent ages" as broad blocks, but one that varies even within these ranges, depending on

15. See Chapter 2 by Ian Pool. This has enormous problems for development (see Gervais Beninguissé and Hamidou Koné's paper in this collection: Chapter 5, "Changement de structure par âge et développement au Cameroun").

factors such as seniority and promotion within the working ages – in short, on ASTs within the working ages).

## 6. Age-Structural Transitions and Specific Millennium Development Goals

It is important to signal that this crosscutting issue also has implications for each of the MDGs:

### *Goal #1 (Eradicate extreme poverty and hunger)*

ASTs have implications for both the supply and demand dimensions of poverty and hunger. For example: Stages in ASTs and family transitions when young families predominate, with young families and with only one or two "breadwinners", are more likely to see poverty and hunger. There is a rapid growth in the child population, typically in countries in which there are problems of food and/or water security.[16] Obviously, this also raises political as well as policy questions. To take another case, out-migrations to search for work can deprive regions of young workers essential for the production of subsistence foodstuffs.

In contrast, during periods in which there are windows of opportunity, when dependency ratios dip, there will be more productive workers. Moreover, this is also related to higher economic growth, higher incomes *per capita* and greater family savings. But this will occur only if there is also investment in employment and human capital.

### *Goal #2 (Achieve universal primary education)*

Education is clearly the key to the development of the human capital essential to exploiting any windows of opportunity. ASTs can have positive effects on this when there are large numbers of young people available to gain skills, but equally well, massive cohorts will make provision of education very difficult to achieve.[17]

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16. The paper presented at the seminar by Philippe Collomb ("Food Security and Age-Structural Transition", not published here) is a summary of a much wider study, in press at present. It shows the impact of child dependency on food security (quantity and quality).

17. This is elaborated in a number of papers preceeding this chapter, but particularly in Anne Goujon's Chapter 4, "Is Progress in Education Sustainable?"

Although many countries have achieved universal education, others have yet to reach this stage. Windows of opportunity could allow universal education to be achieved, or if already so, this is a chance to ensure that its quality is improved. Moreover, where education is not free, if incomes increase, then families will have more capacity to pay for the education of their children.

### *Goal #3 (Promote gender equality and empower women)*

Absolutely central to the promotion of gender equality, are the human capital implications of ASTs.[18] This becomes particularly critical where there are existing inequities (e.g., in education) or where the processes producing ASTs have major gender imbalances, as in the case of migration in the Philippines where women are the out-migrants (cf. China, where the floating population has high masculinity ratios).[19]

Increases in access to education, possible when there is a window of opportunity, could allow increased levels of school attendance by girls. At the same time, the propensity to progress to higher levels will be enhanced, thus increasing their skills, the range of jobs they can enter, and their incomes and bargaining power, in the family and the society in general.

### *Goal #4 (Reduce child mortality)*

The effects of ASTs are more in terms here of the implications of volumes (the numbers of children) on the capacity to provide health services of quality, particularly where food security is weak. The occurrence of a window of opportunity permits a reduction in the number of malnourished children, as noted under Goal #1 above.

### *Goal #5 (Improve maternal health)*

The size of maternal cohorts interacts with the capacity to provide services. Thus, it is again a quantity vs. quality effect. A window of opportunity would enhance the capacity of countries to increase health services for women. This is central to the empowering of women.

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18. This comes through in every case study published here.

19. See Chapter 9 by Socorro Gultiano and Peter Xenos ("Age Structure and Urban Migration of Youth in the Philippines").

### *Goal #6 (Combat HIV/AIDS, malaria and other diseases)*

HIV/AIDS, malaria and other apocalyptic epidemics have a major impact on ASTs, both directly, through mortality, and indirectly, through factors such as orphanhood.[20] A window of opportunity would afford a chance to shift more resources to health services and to malaria control.

Paradoxically, a window of opportunity is associated with larger cohorts reaching adolescent, youth and young adult ages. But these ages are also those at which migration and sexual relationships with multiple partners are most likely to occur. Thus, the incidence of HIV/AIDS and STDs could well increase. HIV/AIDS also then has an effect, through age-specific mortality, on ASTs.

### *Goal #7 (Ensure environmental sustainability)*

The ensuring of environmental sustainability is affected by ASTs in two ways. Firstly, to exploit the window of opportunity requires economic development, and rapid economic growth may produce negative environmental impacts. But secondly, more direct effects are seen when, in order to reduce hunger, attempts are being made to increase agricultural productivity by campaigns that may demand land redistribution or the opening up of common and other public land, especially in the environmentally more fragile[21] regions. The debates around genetic engineering of foodstuffs in part revolve around whether or not food productivity is increased, and at what expense to the environment.

### *Goal #8 (Develop a global partnership for development)*

This goal and its set of indicators essentially underpin the capacity of countries of the South to exploit windows of opportunity. Obviously "good governance" on the part of both the rich and economically disadvantaged, powerful and weak countries, is a prerequisite to planning for and exploiting the window of opportunity. The wealthy

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20. This theme was developed at the Seminar by P. S. Nair ("Age-Structural Transition in Botswana in the Context of HIV/AIDS"). See also G. Beninguissé and H. Koné, Chapter 5, on Cameroon.

21. See the studies for FAO, carried out under the auspices of CICRED. E.g., Gultiano *et al.* (2003).

will need to aid the poor if the latter are to realize effectively the dividends afforded by the window of opportunity; but to manage their window of opportunity, poorer countries will need to set up systems of administration that enhance their capacities to benefit and to ensure that all segments of their societies have an equal opportunity. As will be shown below, ASTs do not exactly follow the same format across all groups and regions within countries, and this affects aspects of governance and management necessary to exploit the window in an equitable manner. But a failure to respond equitably may produce severe tensions within a country, and thus lead to political instability. Special mention should be made of small-island countries where numbers may be small, but where AST effects, such as through migration, may be magnified.[22] These are demographically, politically, environmentally and economically fragile states.[23]

The highest profile interaction between the North and the South is migration, a demographic trend that exacerbates ASTs and which highlights problems of managing them, both in the country of origin and that of destination. As noted earlier, migration may seem to be a mechanism for reducing distortions in age structures in wealthy countries. Through remittances, it may also involve North→South capital transfers and aid development, or at least, sustainability in the South. But the levels needed to achieve this may introduce other distortions in the ASTs of migrant-receiving countries.[24] Equally well, especially if the more talented and younger active workers migrate, emigration may generally affect the structures of source countries.

## 7. The Window of Opportunity: Seizing on It and Exploiting It

It is simple to define the window of opportunity, but much more difficult to formulate a precise index that identifies when countries are about to commence transition, and when an AST is coming to an end.[25] Put most simply, a window of opportunity will be available when levels of dependency decrease, normally as a function of decreases in

22. See Chapter 8 by Kesaia Seniloli ("To Take Advantage of the Demographic Bonus or Not. That Is the Question: The Case of Fiji").

23. See Pool (1982) that outlines these issues.

24. This point is developped in Dittgen (2002).

25. Bloom *et al.* (2003) suggest a formula.

fertility and thus in child dependency, and before they start to increase again as ageing sets in. Parenthetically, it is worth noting that in most countries, total dependency is primarily being driven, even today, by child dependency, and that a shift to a balance weighted towards aged dependency is still well into the future.

In the chapters earlier in this book coming from the CICRED Seminar from which this chapter is derived, most of the case studies focus on identifying **when** ASTs are about to occur, and **what** their impacts might be.[26] A number of very important points were identified:

- In most countries, a window has arrived, or will soon arrive over the next decade or so. Thus, there is a real need to look urgently but carefully at ASTs, especially during the life of ICPD.
- The speed with which the windows of opportunity will come and go, that is, the duration that they will last, varies enormously from country to country – no single rule applies.
- In most countries, there are regional differences in ASTs and thus in windows of opportunity; in some countries, this may be extreme. In Brazil, this South→North difference almost mirrors the global North→South difference. China is another example where the differences are vast. As a result, internal migration is a critical outcome as young workers move from areas of underdevelopment to developed zones. Even in small-island countries, there can be outer-island – capital-island differences. In the Philippines, a relatively unperturbed national AST was accompanied by marked sub-national differences.[27]
- There are also many other AST differentials, such as by gender, by tax revenue and expenditure (by age), by ethnic group, etc.

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26. Many of the papers in this collection provided case studies on windows of opportunity, based on analyses of the way the demographic transitions produced age-structural transitions, e.g., Sri Moertiningsih Adioetomo (Chapter 6, "Age-Structural Transitions and Their Implications: The Case of Indonesia over a Century, 1950-2050"), Yan Hao (Chapter 11, "Age-Structural Transitions: Major Policy Implications for China"), Laura Rodríguez Wong and José A. M. de Carvalho (Chapter 7, "Age-Structural Transition in Brazil. Demographic Bonuses and Emerging Challenges"), Virgilio Partida Bush ("How the Demographic Transition Forms the Demographic Bonus and the Ageing Population in Mexico", presented at the Seminar), and Ali Ben Brahim ("Transition des structures par âge et vieillissement en Tunisie", presented at the Seminar).

27. See Chapter 9 by Gultiano and Xenos.

- Above all, the exploitation of the window of opportunity can occur only if many national and international resources are mobilized. This is why the issue is highly pertinent for MDG #8.
- Central to the exploitation of windows of opportunity are three mechanisms: savings, human capital and employment.[28] The quantum, flows and stocks of human capital are very much demographic issues driven by ASTs; the quality is, of course, non-demographic in form. But as noted earlier, when looking at MDG #2, demographically driven windows of opportunity are the determinants of the bonuses that will permit the non-demographic quality factors to be enhanced.

## 8. ASTs, Windows of Opportunity and Interrelated Factors

Finally, it must be stressed that ASTs are not occurring in isolation from other changes in the society, economy and environment. A number of interrelated transitions can be noted here:

- *The Demographic Transition* is the driver of ASTs. But ASTs, in turn, have an impact on demographic transition. For example, a population with an age structure weighted towards the younger, more fecundable, reproductive ages will have a potential for a greater number of births, than one with higher proportions at older reproductive ages.
- *The Epidemiological Transition* is also linked to ASTs. An epidemiological transition, at first, is played out by rapid declines in the force of mortality at the younger ages, but later sees the force shift to older and older ages. In developed countries, the possibilities for further increases in survivorship depend on improvements at older ages, as the probability of surviving from birth to old age is very high except for a very small minority in each cohort. But equally well, the age composition of a population is related to its potential for mortality.
- *Transitions in Family Formation, Structures and Forms*: The interlinkages between ASTs and the family transition are very strong. The sizes and age structures of families are an obvious manifestation, but this

28. Identified by Bloom *et al.* (2003).

is true for the context in which family formation takes place – the forms of the union (marriage or cohabitation, and whether or not ex-nuptial births are prevalent or rare), the structures of families (e.g., nuclear or extended; the support networks), and the actual process of childbearing (e.g., timing, spacing and limitation, that are the central concerns of reproductive choice initiatives). For example, Muslim countries in which almost all childbearing is nuptial, but in which ages at marriage are late and celibacy levels high, face a particularly critical interface between their family transitions and their ASTs. Women at prime reproductive ages are not marrying at all, or are delaying to ages when levels of fecundability have declined.[29]

- *Industrial Labour-Force Sectoral Transformation*: Basic to development theory is the issue of labour-force transformation. The growth of the tertiary sector, and especially the highly skilled, poses particular problems for countries going through rapid ASTs and that wish to exploit a window of opportunity by upgrading their human capital.
- *Mobility Transitions*: The links to these have been noted already but cannot be overemphasised.
- *Nutritional Transitions*: The shift from grains to meat proteins, as is occurring across Asia, is another co-varying factor. The impacts of this transition will be most marked in the large cohorts that are currently at youth or young adult ages.

To conclude, returning to the starting point of the paper, the ASTs are a key component of all social and economic development. The window of opportunity that the ASTs might provide, may be exploited to generate sustainable development. To repeat, to fail to exploit windows of opportunity will produce crises for population and development.

**References**

BLOOM, D, CANNING, D and SEVILLA, J (2003) *The Demographic Dividend: A New Perspective on the Economic Consequences of Population Change*, RAND, Santa Monica, Calif.

29. See A. Ben Brahim ("Transition des structures par âge et vieillissement en Tunisie", presented at the Seminar); A. H. Mehryar and S. Ahmad-Nia (Chapter 12).

DITTGEN, A (2002) "Après la transition démographique : l'équilibre ou les turbulences ?", in AIDELF (eds) *Vivre plus longtemps, avoir moins d'enfants : quelles implications ? Colloque international de Byblos-Jbeil (Liban)*, PUF, Paris.

GULTIANO, S, URICH, P, BALBARINO, E and SAZ, E (2003) *Population Dynamics, Land Availability and Adapting Land Tenure Systems: Philippines, a Case Study*, FAO and CICRED, Rome and Paris.

HIGGINS, M and WILLIAMSON, J (1997) "Age Structure and Dependence on Foreign Capital", *Population and Development Review*, 23.

POOL, Ian (1982) "Small Island States", in ESCAP (eds) *Proceedings, Asian Population Conference*, Colombo, 1982.

POOL, Ian (2003) "Ageing, Population Waves, Disordered Cohorts and Policy", *New Zealand Population Review*, 29(1): 19-39.

RINDFUSS, R (1991) "The Young Adult Years: Diversity, Structural Change and Fertility", *Demography*, 28(4).

SHRYOCK, H and SIEGEL, J (1976) *The Methods and Materials of Demography*, Academic Press, New York.

UN (2001) *Replacement Migration. Is It a Solution to Declining and Ageing Populations?* Population Division, Department of Economic and Social Affairs, New York.

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- *Education, Family and Population Dynamics / Education, famille et dynamiques familiales,* Cosio M. E., Marcoux R., Pilon M., Quesnel A., (eds.), Paris, CICRED, 2003, 363 p. (Seminar held in Ouagadougou, Burkina Faso, 15-19 November 1999).
- *Poverty, Fertility and Family Planning / Pauvreté, fécondité et planification familiale,* Cosio-Zavala M. E., (ed.), Paris, CICRED, 2003, 358 p. (Seminar held in Mexico City, Mexico, 2-4 June 1998).

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