Economics Division Working Papers

Development Issues

The population of Ethiopia, 1990–2025: possibilities for the future

Zemicael Desta

93/3

search School of Pacific Studies ANU

Enquiries
The Editor, Working Papers
Economics Division
Research School of Pacific Studies
The Australian National University
Canberra 0200
Australia

Tel (61-6) 249 4700
Fax (61-6) 257 2886

The Economics Division encompasses the Department of Economics, the National Centre for Development Studies and the Australia-Japan Research Centre from the Research School of Pacific Studies, The Australian National University. Its working paper series is intended for prompt distribution of research results. This distribution is preliminary work; work is later published in refereed professional journals or books. The Working Papers include work produced by economists outside the Economics Division but completed in cooperation with researchers from the Division or using the facilities of the Division. Papers are subject to an anonymous review process. All papers are the responsibility of the authors, not the Economics Division.

Economics Division Working Papers

Development Issues

The population of Ethiopia, 1990–2025: possibilities for the future

Zemicael Desta

93/3

Research School of Pacific Studies ANU

F. RL 6.

Published by the National Centre for Development Studies
Printed in Australia by Better Printing Service, 1 Foster Street, Queanbeyan, NSW, 2620

The Economics Division acknowledges the contribution made by the Australian International Development Assistance Bureau towards the publication of this working paper.

ISBN 0 7315 1696 6

Key to symbols used in tables

n.a.	Not applicable
..	Not available
-	Zero
.	Insignificant

Zemicael Desta is an MA student at The Australian National University and works at the Australian Bureau of Statistics, Canberra.

This paper is based on a research project on population projections undertaken as a graduate student in 1992 in the Graduate Studies in Demography program at the National Centre for Development Studies, The Australian National University. I am grateful to Drs Paul Meyer and Habtemariam Tesfaghiorghis for their valuable guidance and comments. Thanks are also due to Dr Lorraine Corner for providing useful suggestions and comments for this paper. I would also like to extend my gratitude to Ms Marian May and Tikka Wilson for their editing assistance.

Abstract

With an estimated population of 49.2 million in 1990 and a rate of natural increase of 2.9 per cent per annum, Ethiopia is facing a population crisis. This rapid population growth is due to very high fertility and moderate declines in mortality. The challenge posed by this demographic problem is compounded by a low level of socioeconomic development, the war and the drought years of the past two decades. Population projections for 1990 to 2025 indicate the potential for a massive increase in the population of Ethiopia. Three future scenarios are modelled in this paper. Under the high variant projection, the population would increase to 144 million by 2025, almost triple its 1990 size; while under the medium variant, it is projected to grow to 125 million over the same period. It is only under the fast fertility decline assumptions of the low variant projection that the population can be contained at about 110 million over the next 35 years. The consequences and policy implications of these population projections for Ethiopia are clear: since Ethiopia is unlikely to be able to satisfactorily maintain more than twice its current population numbers in 35 years, a rapid decline in fertility rates is essential. A fast fertility decline will require the adoption and implementation of strong population programs, goals and supporting institutional changes. Achieving the low variant demographic targets is not only a demographic necessity for Ethiopia, but also a mechanism for enhancing the possibility of sustainable development over the long term.

The population of Ethiopia, 1990–2025: possibilities for the future

Ethiopia's first-ever Population and Housing Census of May 1984 revealed a population of 42.6 million (Ethiopia 1991). The country occupies an area of 1.25 million square kilometres. It is the third most populous (after Nigeria and Egypt) and the eleventh largest country in Africa. Nonetheless, Ethiopia has a low socioeconomic base with a per capita income of US$120 in 1990 (World Bank 1991). It is a predominantly rural country, with an urban population of only 13 per cent of the total in 1990 (UNICEF 1992). Since the 1970s, Ethiopia has experienced persistent droughts and famines undermining its huge agricultural potential. The famine of 1983–85 caused over one million deaths and the displacement of 2.5 million of the rural people to urban areas (Dawit 1987:16–21). Forced migration following war and/or famine also has been significant; about 1.5 million people fled Ethiopia between 1980 and 1987 alone (United Nations 1990:222).

The demographic situation

The estimated levels of fertility over the last three decades as measured by the total fertility rate have ranged between 5.5 and 7.7 children per woman (Tesfaghiorghis 1990:180). The 1990 crude birth rate is estimated at about 49 births per 1000 and the total fertility rate at around 7 children per woman (UNICEF 1992:80). The coverage of family planning services is 2 per cent (Family Guidance Association of Ethiopia 1986:43). On the other hand, mortality has been declining in Ethiopia from a crude death rate of 28 per 1000 and an expectation of life at birth of 36 years in the early 1960s, to a crude death rate of about 20 per 1000 and a life expectancy at birth of 47 years for both sexes in 1990 (UNICEF 1992:72, 80). Hence with an estimated crude birth rate of 49 and a crude death rate of 20, Ethiopia has a high rate of natural population growth of 2.9 per cent per annum, implying a doubling of its population in 24 years.

The rapid population growth in Ethiopia is due primarily to very high and rising fertility (because of the reduction in infecundity), and to moderate declines in mortality as a result of malaria control and increased provision of health care (Tesfaghiorghis 1990). The large population base of the country and its high

fertility, coupled with a high-growth momentum, have resulted in very rapid population growth. This has already exacerbated population pressures on land (especially in the northern regions) and has had serious consequences for the economy and the environment.

Emerging need for a population policy

Since 1988, Ethiopia has viewed its current rapid population growth as 'unsatisfactory' and has been contemplating reducing growth by encouraging fertility regulating measures (United Nations 1990:86). The previous government had, theoretically, adopted the objective of 'Health for All by the Year 2000' to reduce mortality through primary health care and immunisation services (particularly for children and mothers), but the government's program was haphazardly conceived and poorly implemented. Given the war situation, the rampant corruption that prevailed until mid-1991, the localised inter-ethnic conflicts that ensued and the poor state of its economy, Ethiopia is unlikely to achieve the objective of health for all in less than ten years.

Ethiopia has not had an explicit population policy and there are no quantitative demographic targets concerning either population growth and size or other broad demographic variables. An attempt was made in 1990 to formulate a population policy, but it never materialised owing to the government's preoccupation with the protracted war against its people, particularly in Eritrea and Tigrai.

The defeat of the Ethiopian Army in Eritrea by the Eritrean Peoples' Liberation Front (EPLF) and the overthrow of the government in May 1991 by the Ethiopian Peoples' Revolutionary Democratic Front (EPRDF), in which the Tigraian Front played the major role, effectively ended the catastrophic 30-year war in Eritrea as well as 17 years of dictatorial rule and civil war in Ethiopia. This creates potentially favourable conditions for the adoption of a population policy, a policy which is crucial if the country is to overcome its acute demographic and socioeconomic problems.

Aims and methodology

It is hoped that the results of the population projections presented in this paper will be a useful contribution to the development of appropriate population policies and strategies. Population projections by age and sex groups may also facilitate effective integration of population factors into development planning. Furthermore, the quantitative implications of population projections could be useful in developing appropriate public policies and programs on food, housing,

education, health, employment, consumption and investment (Tesfaghiorghis 1985).

A set of three population/demographic projections for Ethiopia has been constructed for the period 1990–2025: 'high variant', 'medium variant' and 'low variant'. These projections have been prepared using the FIVFIV projection package (Shorter and Pasta 1991) on the basis of the modified cohort-component method, by first assembling the data on total population by five-year age groups and sex and the associated growth components. The West family of the model life tables (an average in the Coale-Demeny family) is assumed to apply for Ethiopia. The schedule of fertility by age within the total fertility rate has been generated by the package from the assumed total fertility rates.

Due to the lack of separate and reliable demographic data, the projections include the new state of Eritrea which, in May 1993, declared its independence from Ethiopia following a referendum that concluded with 99.8 per cent in favour. Eritrea with an area of 121,000 square kilometres had a population of 2.7 million at the time of the 1984 Census. This is an official estimate only, as no census data were collected in Eritrea because of the war. The Eritreans estimated their population between 3.2 and 3.5 million in the early 1990s (Eritrea 1993).

Ethiopia is culturally and geographically diverse, and wide regional variations in fertility, mortality and migration are expected. According to Tesfaghiorghis (personal communication), variation is more pronounced between Ethiopia and Eritrea because the effects of the war, droughts and famines on demographic processes were greater in Eritrea than in Ethiopia. However, as the population of Eritrea is between approximately 6 and 8 per cent of the population of Ethiopia, its effect on the population size of Ethiopia is moderate. Thus, as the exclusion of Eritrea from the projections will not considerably affect the implications of the massive future population growth, the results of the projections are expected to be useful and valid.

After briefly describing the selection and sources of the base period data, the formulation of assumptions regarding future trends in fertility and mortality are discussed. Varying combinations of the growth components are utilised to ensure that the projections finally adopted represent what are indeed the most plausible 'estimates'; they are not a prediction of future population. The projection results are then analysed with a view to highlighting their implications and finally, a recommendation for the adoption of a comprehensive population policy is proposed.

Selection and sources of base period data

As Ethiopia's most recent population census counts (42.6 million) by age and sex are nine years old now, 'errors in the these parameters could lead to faulty projections if used as the basis of projections' (Economic Commission for Africa 1985:4). Hence, 1990 United Nations population data have been used to prepare the projections (United Nations 1991b:168–9). New information indicating higher levels than previously estimated of total fertility (from 6.15 to 6.78) for the period 1985–90 resulted in a major upward revision of the 1990 population estimate, from 46.7 million to 49.2 million (United Nations 1991a:33). This adjusted estimate by five-year age distribution is used for the selected base period. With further pro-rata adjustments to the distribution by sex made in line with the final results of the 1984 Census, the 1990 base population and age–sex data are deemed to be of adequate quality for constructing the projections. A sex ratio at birth of 103 males per 100 females is assumed as this is thought to be consistent with the national situation.

Base period fertility and mortality data

The lack of a registration system of vital events in Ethiopia has made it necessary to rely on figures derived from indirect methods of estimation. Essentially, the estimated total fertility rates and mortality rates are derived from survey or census information on children ever born and surviving by age of mother and births/deaths in the last 12 months by age of mother, and assumed subsequent trends (United Nations 1991a:59).

The fertility and mortality assumptions for the medium variant projection are almost the same as the 1990 revised estimates of the UN Population Division (see United Nations 1991a:391). Fertility and mortality assumptions have been made for the high and low variants that take account of the country's past and present socioeconomic conditions (as well as the recurrent famines), to ensure the plausibility of the scenarios and at the same time to demonstrate the strong impact on population growth of fertility relative to mortality.

Refugee movements in the past have been significant. Now that the war is over, both the Ethiopian and Eritrean governments are encouraging return migration, and refugee repatriation programs are underway. Net international migration will have an impact on population growth, probably for the next 10 years, but it is assumed to be nil for lack of current data.

Construction of projections

The projection assumptions of future trends in fertility and mortality are based on classic demographic transition theory. This theory postulates that as countries industrialise and urbanise, death rates fall and then birth rates also decline (Haub 1987:19). The essence of the theory (in the context of Ethiopia) is that family limitation and mortality reduction are necessary consequences of socioeconomic development (Economic Commission for Africa 1985:62).

Broad assumptions

For the medium variant projection, where fertility is assumed to decline gradually, the United Nations model assumes that replacement-level fertility in Ethiopia will be reached within 50 to 55 years (United Nations 1991a:45), from a total fertility rate of 6.78 in the period 1990–95. For the low variant projection, the replacement level is targeted to be reached in 2025 (35 years) and to stabilise there. Replacement-level fertility is the fertility level that produces a net reproduction rate of one; that is, when each mother replaces herself with a daughter a generation later (after 28 years on average in Ethiopia's case). A net reproduction rate of 1.0 implies a total fertility rate of 2.1 to 2.4, depending on the level of mortality.

In line with the United Nations models for mortality reduction, an improvement in the expectation of life at birth of 0.5 years per annum for both sexes has been assumed for the low variant population projection (United Nations 1991a:35). However, available data and the known poor socioeconomic situation in Ethiopia in the recent past would suggest an annual improvement of the expectation of life at birth of about 0.4 years for the medium variant, and a worst case scenario of almost no improvement for the high variant.

Variant assumptions

Assumptions are made for fertility and mortality trends for each of the projections (Table 1, Figures 1 and 2). For the high variant projection, constant high fertility (6.8) throughout the projection period is assumed. This is mainly intended to provide a benchmark against which the effects of fertility decline can be measured; but it also reflects existing inconsistencies in the data on the country's total fertility rate for the 1990–95 period: the UNICEF estimate is 6.8 while the (1992:80) UN Population Division estimate is 7.5 (1991a:391).

Table 1 Projected trends in fertility and mortality, 1990–2025

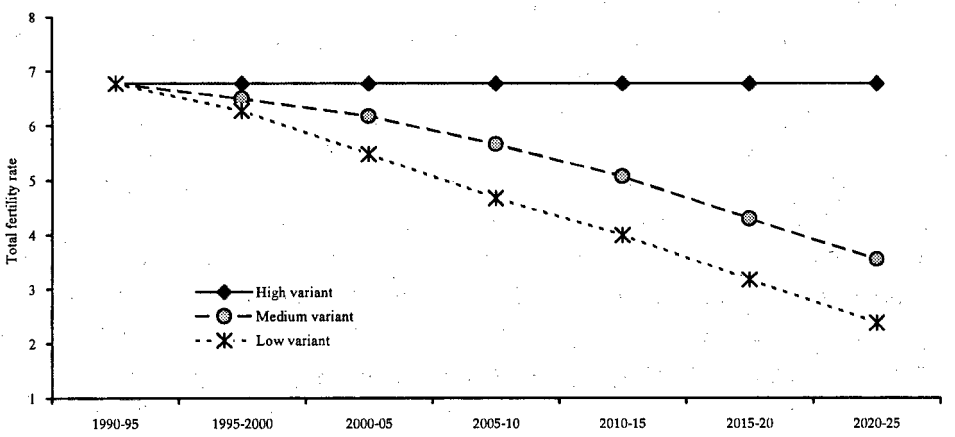
Fertility	High variant	Medium variant	Low variant
1990–1995	6.78	6.78	6.78
1995–2000	6.78	6.50	6.28
2000–2005	6.78	6.18	5.48
2005–2010	6.78	5.66	4.68
2010–2015	6.78	5.07	4.00
2015–2020	6.78	4.30	3.18
2020–2025	6.78	3.55	2.38
Mortality			
1990–1995	47.03	47.03	47.03
1995–2000	49.03	49.03	49.53
2000–2005	48.03	51.00	52.03
2005–2010	47.03	53.00	54.53
2010–2015	49.03	55.00	57.03
2015–2020	48.03	57.00	60.03
2020–2025	47.03	59.00	63.03

Note: Fertility = total fertility rate per women;
mortality = expectation of life at birth for both sexes.
Source: Author's estimations.

For the medium variant, a moderate decline in fertility beginning in the year 2000 is assumed with the total fertility rate falling to 3.5 by 2020–25 (a linear decline of 48 per cent in 35 years) and replacement fertility achieved by 2040–45. This is in line with the trend projected under the United Nations medium fertility assumptions (United Nations 1991a: 45) and represents what can be expected to occur spontaneously in the course of normal socioeconomic development, without direct government intervention.

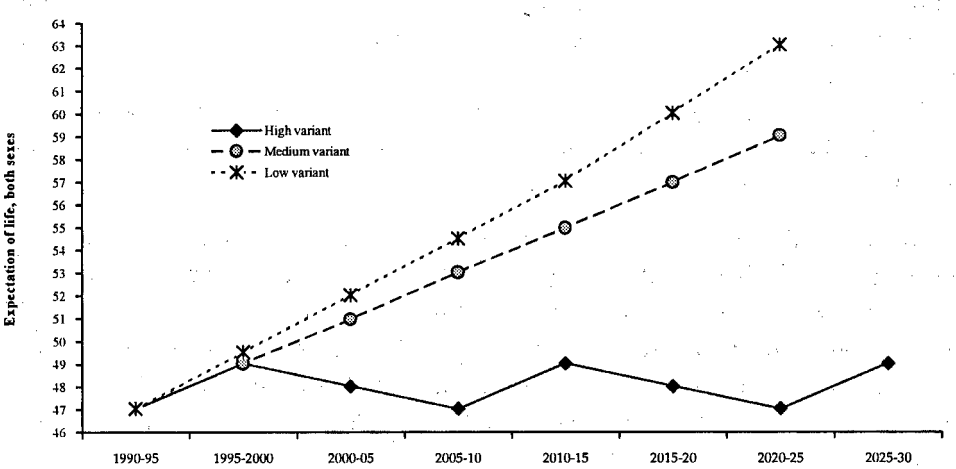
The low variant projection assumes a more rapid fertility decline. The onset of fertility decline is assumed to start in the period 1995–2000. The total fertility rate will be 6.78 for 1990–95, 6.30 for 1995–2000, and 4.68 for 2005–2010 with close to replacement fertility (total fertility rate of 2.38 = a net reproduction rate of 1.04) achieved by 2020–25. This ambitious linear decline of 65 per cent represents the best that could be achieved with strong government population policies as well as expansion of education and health facilities, especially in the rural areas where both fertility and mortality rates are very high.

Figure 1 Projections of total fertility rates, 1990–2030



Source: Population projections, Appendix.

Figure 2 Projection of expectation of life at birth, 1990–2030



Source: Population projections, Appendix.

The assumptions in the expectation of life at birth made here for mortality trends are for both sexes, although the projections have been made to reflect the mortality differentials that favour females by three years on average. The assumption for the high variant is of almost no change in overall mortality from the current level of 47 years in the 1990–95 quinquennium. This assumption exhibits a cyclical trend of an initial rise in the expectation of life at birth followed by a period of decline, and vice versa. There is no improvement by the end of the projection period. This is intended as an illustration of the worst case possible, a situation of recurring drought, flare-up of inter-ethnic war and a rapid spread of HIV/AIDS related deaths. The assumption for the medium variant is of a steady moderate decline in mortality with the expectation of life at birth rising from 47 years in the early 1990s to 59 years in the period 2020–25 (a considerable improvement of 25 per cent). The trend for the low variant is of a faster decline in mortality throughout the projection period, where the expectation of life at birth rises from the base of 47 years to 63 years (an increase of 34 per cent by the end of the projection period).

Owing to the problems posed by rapid population growth, the low variant assumptions are specifically designed to reflect the potential of population policies for Ethiopia and these significantly influence all other demographic variables. Hence, the ambitious low variant projection results will be treated as demographic targets. To achieve these targets would require a synergistic approach to family planning programs that includes improving female education, raising the status of women, reducing the proportion of female marriages under age 18, and enhancing maternal health and child survival (United Nations 1989). Evidence from other developing countries indicates that this approach leads to family limitation and subsequent declines in fertility (Nag 1989; United Nations 1989).

It is possible to estimate the scale of effort that will be required on the population front if a significant fertility decline is to be achieved. For instance, in relation to the target low variant total fertility rate projection assumptions (Table 1), the contraceptive prevalence rates required to achieve these levels of fertility decline can be roughly calculated to fall around 25–30 per cent, 40–45 per cent and 65–70 per cent in the periods 2000–2005, 2010–2015 and 2020–2025, respectively.

Results of population projections

A combination of fertility and mortality trends of high with high, medium with medium, and low with low assumptions reveal the potential for massive population growth in Ethiopia under all three variants. The projected population size of Ethiopia in the next 35 years is summarised in Table 2 and Figure 3. Under the high variant projection, the population which was 49.2 million in 1990 will grow by 57 per cent to reach more than 77 million by 2005 and increase to 144 million in 35 years, almost three times its size in 1990. This is mainly due to a high fertility level, resulting in a very rapid population growth rate. With a moderate decline, however, it is projected to increase by 55 per cent to reach 76 million by 2005 and grow to 125 million in 35 years. Even if fertility and mortality decline rapidly, the population which was 49.2 million in 1990 is projected to increase by 52 per cent to reach 75 million by the year 2005, and by around 100 per cent to reach 110 million in the year 2025.

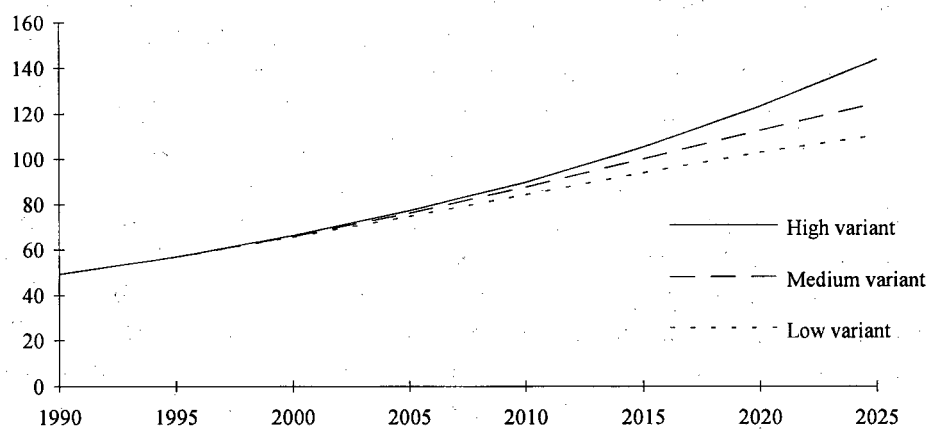
Table 2 Projected population size, 1990–2025 (in millions)

Year	High variant	Medium variant	Low variant
1990	49.2	49.2	49.2
1995	56.9	56.9	56.9
2000	66.3	65.8	65.5
2005	77.2	76.1	74.6
2010	89.7	87.6	84.1
2015	105.3	100.1	93.9
2020	123.2	112.7	103.0
2025	143.8	124.6	110.4

Note: The figures are for total population, both sexes.
Source: Population projections, Appendix.

The capacity for future growth will remain substantial at the end of the projection period. If fertility does not fall, the growth rate will rise from 2.9 to a minimum of 3.08 per cent per annum by the period 2020–25, allowing a further doubling to 288 million within the following 22.7 years. A fertility decline can make a substantial impact in the longer term. Although the differences in total population among the three variants may be minor by 2005, they could amount to as much as 34 million by 2025.

Figure 3 Projected population size, 1990–2025 (in millions)



Source: Population projections, Appendix.

Even a moderate decline in fertility will cut potential population size by 13 per cent while the potential of a fast decline is 23 per cent. The potential future growth rate would be also sharply reduce by 34 per cent and 55 per cent in the medium and low variants, respectively (Table 3).

High fertility and mortality implies that Ethiopia has a young population, with a median age of 17 years. In 1990, the proportion of children under 15 years and that of the elderly (over 65) was 45.6 and 2.9 per cent, respectively. The country has the demographic characteristics and age structure typical of populations just about to begin a demographic transition.

Trends in fertility decline produce dramatic effects on the population structure by reducing the proportion of children, and mortality decline raises the likelihood of survival to old age (United Nations 1991c:1). In the high variant projection, the structure of the population would remain relatively constant. Under the medium and fast fertility declines, however, the age structure of the population changes dramatically. The shape of the population pyramid changes from having a wide base and a narrow top to a pattern with undercutting in the population under the age of 14. The excess of females over males in the 75 and over group also disappears (Figure 4 in conjunction with Table 4).

Table 3 Projected population growth rates, 1990–2025 (per cent)

Year	High variant	Medium variant	Low variant
1990–1995	2.90	2.90	2.90
1995–2000	3.06	2.91	2.82
2000–2005	3.03	2.91	2.59
2005–2010	3.01	2.82	2.38
2010–2015	3.20	2.66	2.21
2015–2020	3.14	2.36	1.86
2020–2025	3.08	2.02	1.39

Note: Average annual rate of increase, both sexes.
Source: Population projections, Appendix.

The progressive impact of declining fertility (mainly) and mortality rates on the age structure is particularly evident in the 0–4 and 5–9 age groups of the medium and low variant population pyramids. Low and negative rates of population change groups result in a substantial decrease in the proportion and potential size of the very young population (Tables A9 and A14).

As indicated earlier, under the high variant projection the age structure of the population remains relatively constant over the next 35 years. The dependency burden (the ratio of the population aged 0–14 and 65 years and over to the working age population of 15 to 64), however, will increase from 94 per 100 in 1990 to 97 per 100 by 2025, or about one dependent person per adult worker.

Clearly, the age distribution in Ethiopia is not favourable to socioeconomic development. Declines in fertility, however, by reducing birth rates, will lower the proportion of children in the population although absolute numbers will continue to grow. Even the gradual decline scenario would reduce the proportion of children from 46 per cent to 38 per cent in 35 years, while the fast decline scenario would cut it to 32 per cent over the same time period (Table 4). At the same time, the proportion of the elderly (aged 65+) would marginally increase from 2.9 per cent to 3.0 per cent in the medium variant projection, but would increase considerably to 3.6 per cent in the low variant. The proportion of the working population is projected to increase from 51.5 per cent to 59 per cent in the medium variant and to about 64.4 per cent in the low variant. Consequently the dependency burden will fall for many years. With the gradual/moderate decline assumptions, the dependency ratio would decline to 69 by 2025. The fast decline assumptions (low variant), however, would cut it significantly to 55 per 100 workers (Table 5).

Figure 4 Projected age–sex structure, 1990–2025 (per cent)

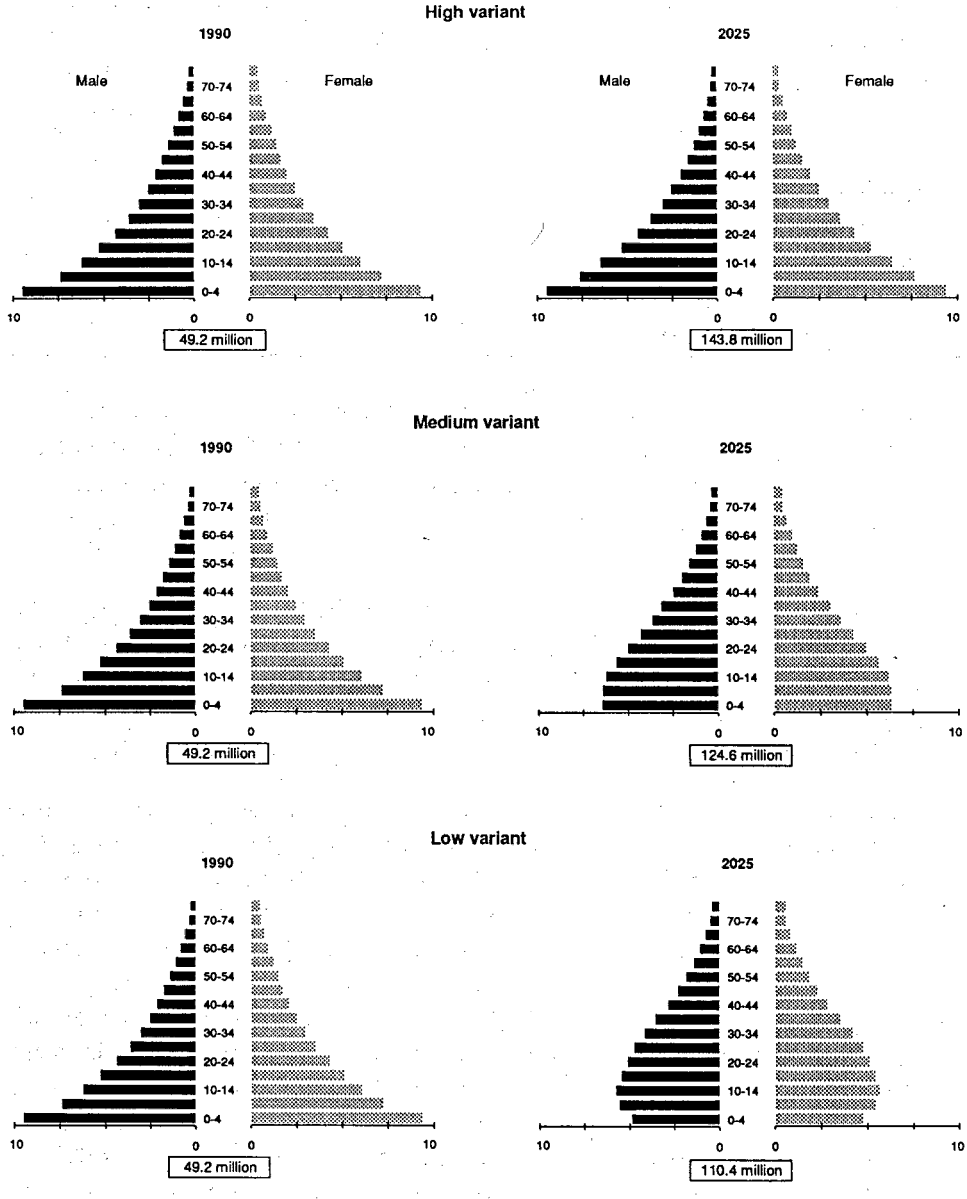


Table 4 Projected population age structure 1990–2025 (per cent)

	0–14	15–64	65+	Total
High variant				
1990	45.6	51.5	2.9	100
2005	46.2	51.3	2.6	100
2025	46.9	50.8	2.3	100
Medium variant				
1990	45.6	51.5	2.9	100
2005	45.0	52.3	2.7	100
2025	37.8	59.2	3.0	100
Low variant				
1990	45.6	51.5	2.9	100
2005	44.0	53.2	2.8	100
2025	32.0	64.4	3.6	100

Source: Population projections, Appendix.

Table 5 Projected age dependency ratios, 1990–2025

	1990	2005	2025
High variant	94	95	97
Medium variant	94	91	69
Low variant	94	88	55

Source: Population projections, Appendix.

The assumptions of moderate and rapid fertility and mortality declines will bring about reduced crude birth and death rates per 1000 (Table 6). In the medium variant, the crude birth rate falls from a high level of 47 per 1000 to 29 per 1000 (a reduction of 38 per cent), while in the low variant it falls to 21 per 1000 (a decline of 55 per cent). Similarly, by the end of the projection period, the medium and low variant crude death rates will fall from the high level of 18 per 1000 to 9 and 7 per thousand respectively (declines of 50 and 59 per cent).

The assumption of significant improvements in the expectation of life at birth also brings about substantial reductions in infant mortality rates (Table 7). Under the high variant, the extremely high infant mortality rate of 138 per 1000 (for both sexes) stays very much the same until the end of the projection period. Under the medium variant, however, there is a marked decline in the infant mortality rates from 138 to 75 (an improvement of 46 per cent). On the other hand, the projections

show that the infant mortality rate in the early 1990s will fall to 57 per 1000 under the low variant assumptions (an improvement of nearly 60 per cent). This is a substantial decline, but a more plausible target would be an infant mortality rate of 30 per 1000 by 2025. This occurs because there is a positive relationship between fertility and infant mortality—as fertility rates fall so do the infant mortality rates and vice versa.

Table 6 Projected vital rates of the population, 1990–2025 (per 1000)

Year		High variant	Medium variant	Low variant
1990–1995	CBR	47.1	47.1	47.1
	CDR	18.1	18.1	18.1
1995–2000	CBR	47.2	45.4	44.0
	CDR	16.6	16.3	15.8
2000–2005	CBR	47.5	43.8	39.6
	CDR	17.2	14.7	13.6
2005–2010	CBR	48.0	41.3	35.6
	CDR	17.9	13.1	11.8
2010–2015	CBR	48.4	38.4	32.3
	CDR	16.4	11.7	10.3
2015–2020	CBR	48.5	33.9	27.2
	CDR	17.1	10.3	8.7
2020–2025	CBR	48.6	29.3	21.3
	CDR	17.8	9.1	7.4

Note: CBR = crude birth rate; CDR = crude death rate.

Source: Population projections, Appendix.

Table 7 Projected infant mortality rates, 1990–2025 (per 1000)

Year	High variant	Medium variant	Low variant
1990–1995	138	138	138
1995–2000	127	127	124
2000–2005	133	116	110
2005–2010	138	105	97
2010–2015	127	95	85
2015–2020	133	85	71
2020–2025	138	75	57

Note: Infant mortality rates per thousand live births, both sexes.

Source: Population projections, Appendix.

Impact of fertility and mortality

The population projections for Ethiopia show that the impact of mortality trends on population size and growth is relatively minor, while the impact of trends in fertility is crucial. Even if Ethiopia were to experience almost no improvement in mortality conditions (life expectancy remaining at the average level of 47 under the high variant), or if an overall gradual decline in mortality were offset by severe and recurrent famine mortality or the advent of excessive deaths due to the AIDS virus, population growth is still projected to be massive: 144 million by 2025. Worse still, if the constant high fertility assumptions are combined with moderate declines in mortality, the projected population size would climb to more than 150 million. A gradual fertility decline together with an improvement in the expectation of life at birth of 0.4 years per annum, would reduce this number to only 125 million. A fast fertility decline with 0.5 years per annum improvement in the expectation of life at birth would, however, cut it to 110 million. Over the next 35 years, population size would therefore be only 13 per cent smaller under the medium variant assumptions and, significantly, 23 per cent smaller under the low variant assumptions than it would be under the constant high fertility and mortality assumptions of the high variant. The impact of the medium mortality decline assumption on population growth would be small by 2025, while the medium fertility decline assumption has much greater potential for future population increase as the growth rate would remain at around 2.8 per cent until 2010.

In earlier population projections for Ethiopia, I have demonstrated (more explicitly) that trends in fertility are the major determinant of future population size by holding the expectation of life of 47 years (high mortality) constant for both the high and the low variant projections and varying only fertility. The results were that in 35 years the population would still be more than double its 1990 size even with a fast fertility decline for the duration of the projection period. The braking effect of continued heavy mortality on population growth would be relatively small, as no decreases in mortality would reduce the projected population from 110 million to 101 million (9 per cent) in the low variant. The above mortality assumption is more of a theoretical exercise rather than realistic or practical.

Consequences and implications

In the short run, population growth in Ethiopia cannot be slowed significantly. Not only are the contraceptive prevalence rates very low, but also the youthful age structure of the population causes a growth momentum. In the medium and

long term, however, trends in fertility will be a major factor in determining the rate at which the government can bring food and social services to the people. Most of the rewards from a fast fertility decline which begins now will be earned only in the long term.

Even if the transitional government of Ethiopia were to adopt a population policy soon and take the low variant projection results as its target, the population will almost certainly grow to about 110 million over the next 35 years. However, the enormous advantage to be gained from attaining (some) of this target is that it will permit the population to stabilise there. Without intervention, the population could swell to more than 125 million. The serious consequences of such a very large population for this already poor country are obvious: it will strain the country's capacity to feed itself; provision of health, housing, education and other services to the people will be extremely difficult; and it is unlikely that enough jobs will be created to maintain even average living standards. The quantitative implications of a large population cannot be discussed in this paper because of the lack of detailed and current socioeconomic data. Nevertheless, it is not hard to imagine that the government will be unable to provide education to 21 million children aged 5 to 14 by the year 2005 (Table A.7). Likewise, there is no doubt that it would be beyond the government's means to bring family planning services to the projected 17 million women of reproductive age (ages 15–49), let alone to provide maternal and child health care (MCH program) for the projected 31 million total MCH target population who will need this care by 2005 (according to the medium variant projection). These numbers are likely to increase by 87 and 57 per cent respectively by the year 2025 (Table A.7).

The issue here is not so much the maximum population size that the land resources could ultimately support: 'Theoretically, Ethiopia has the agricultural potential to support a population two or three times its present size at adequate levels of food consumption and standard of living' (World Bank 1985:7). The critical elements, however, are time and inadequate investment capital. Given the general socioeconomic backwardness as well as the war and drought years of the 1970s and 1980s, Ethiopia is unlikely to develop its resources sufficiently rapidly to maintain more than twice its current population numbers at a satisfactory level of welfare within 35 years. It is also likely that Ethiopia may face a severe structural economic crisis as a result of the radical move away from a centrally planned economy towards a market-oriented system. Thus, a fast decline in fertility is urgently needed to contain the rapid population growth to ensure improvements in socioeconomic conditions for the population of Ethiopia.

What future will Ethiopia choose?

To sum up, the rapid population growth in Ethiopia is due to the very high fertility and moderately high but declining mortality. The projections constructed in this paper clearly show that the potential for massive population growth is great over the next 35 years, particularly under the high and medium variant assumptions. Such growth would place extra demands for education, housing, health services and jobs that would be difficult for the country to provide. Moreover, it will worsen the already unfavourable age structure of a population (in which the proportion of children under age 15 is already too high), and increase the ratio of dependency on the working age population. It is also recognised that rapid population growth by itself can provide little direct stimulus to economic development. To the contrary, it will further exacerbate population pressure on land and will have serious consequences for the environment—more droughts and famines.

According to the classical demographic transition model, in the absence of direct government intervention to regulate fertility, a moderate or gradual decline in fertility of the type assumed in the medium variant projection might be expected to occur in the normal course of socioeconomic development; but replacement-fertility will be delayed until 2045. A fast fertility decline under the low variant projection assumptions is therefore crucial if the country is to overcome its current acute demographic problems. This is the only hope for sustained improvement in the health and living standards of the Ethiopian people over the long term. A fast decline of the type outlined in the low variant projection is targeted to allow the population to stabilise at about 110 million by 2025, and represents the best that could be achieved with strong government multisectoral programs. To move toward such a decline would require the adoption of population policies and programs and 'supporting institutional changes' (World Bank 1985:v).

In conclusion, it appears that the recent changes in political leadership and the subsequent reorganisation of administrative structures will facilitate the implementation of population and other related public policies. However, socio-cultural problems, constraints on the government budget, droughts, and lack of management and organisational skills might make the attainment of the low variant demographic targets outlined in this paper somewhat difficult. Nevertheless the consequences and policy implications of the results of these population projections for the country clearly show that it is hard to conceive of any viable investment which will have greater returns in terms of the well-being of the people of Ethiopia in the twenty-first century than the adoption and

implementation of a comprehensive population policy. This policy needs to be integrated with the socioeconomic and political reform programs currently underway in the country.

Experience in other countries such as Sri Lanka and the state of Kerala, India (Nag 1989) indicates that government policies and programs can influence fertility significantly at relatively small funding levels. To this end, setting up a national family planning program and speeding up the expansion of primary education as well as maternal and child health care services in rural areas is vital to slowing down the rapid population growth. Implementing and achieving the low variant demographic targets must not only be taken as a demographic necessity, but also as a mechanism that will greatly enhance the possibility of sustainable development in this potentially rich country.

Appendix: Projections of the population of Ethiopia, 1990–2025

Table A1 High variant fertility and mortality projections, 1990–2025

Age	1990–95	1995–2000	2000–05	2005–10	2010–15	2015–20	2020–25
Fertility[a]							
	Distribution of fertility by age (per cent) using models						
15–19	11.0	11.0	11.0	11.0	11.0	11.0	11.0
20–24	23.2	23.2	23.2	23.2	23.2	23.2	23.2
25–29	24.2	24.2	24.2	24.2	24.2	24.2	24.2
30–34	20.1	20.1	20.1	20.1	20.1	20.1	20.1
35–39	13.6	13.6	13.6	13.6	13.6	13.6	13.6
40–44	6.6	6.6	6.6	6.6	6.6	6.6	6.6
45–49	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Age specific fertility schedule						
15–19	0.149	0.149	0.149	0.149	0.149	0.149	0.149
20–24	0.315	0.315	0.315	0.315	0.315	0.315	0.315
25–29	0.328	0.328	0.328	0.328	0.328	0.328	0.328
30–34	0.273	0.273	0.273	0.273	0.273	0.273	0.273
35–39	0.184	0.184	0.184	0.184	0.184	0.184	0.184
40–44	0.089	0.089	0.089	0.089	0.089	0.089	0.089
45–49	0.018	0.018	0.018	0.018	0.018	0.018	0.018
TFR	6.780	6.780	6.780	6.780	6.780	6.780	6.780
GRR	3.340	3.340	3.340	3.340	3.340	3.340	3.340
NRR	2.371	2.451	2.411	2.371	2.451	2.411	2.371
Mean age	28.855	28.855	28.855	28.855	28.855	28.855	28.855
Mortality							
West							
E(0) females	48.70	50.70	49.70	48.70	50.70	49.70	48.70
E(0) males	45.40	47.40	46.40	45.40	47.40	46.40	45.40
E(0) both	47.03	49.03	48.03	47.03	49.03	48.03	47.03
IMR females	125.79	115.22	120.41	125.79	115.22	120.41	125.79
IMR males	150.49	138.23	144.36	150.49	138.23	144.36	150.49
IMR both	138.32	126.89	132.56	138.32	126.89	132.56	138.32
E(5) females	55.15	56.31	55.75	55.15	56.31	55.75	55.15
E(5) males	52.78	53.90	53.35	52.78	53.90	53.35	52.78
E(5) both	53.95	55.09	54.53	53.95	55.09	54.53	53.95

[a] Sex ratio at birth: 103 males per 100 females.

Notes: E(0) = life expectancy at birth; E(5) = life expactancy at age 5; IMR = infant mortality rate; TFR= total fertility rate, GRR = gross reproductive rate; NRR = net reproductive rate; mean age = the average age of mothers at the birth of their daughters..

Source: Author's estimations

Table A2 **High variant population projection** (millions)

Age	1990	1995	2000	2005	2010	2015	2020	2025
Females								
0–4	4584.0	5208.9	6152.3	7149.7	8348.4	9988.5	11639.4	13508.8
5–9	3531.0	4307.3	4929.2	5800.9	6718.0	7900.0	9417.9	10936.7
10–14	2945.0	3464.1	4233.9	4840.4	5691.0	6603.7	7757.8	9239.5
15–19	2491.0	2883.6	3398.7	4149.8	4739.4	5583.5	6472.5	7595.9
20–24	2078.0	2423.0	2811.6	3310.2	4036.6	4621.1	5438.1	6295.9
25–29	1725.0	2010.1	2350.3	2723.8	3202.0	3915.5	4476.9	5260.5
30–34	1444.0	1661.2	1941.9	2267.2	2623.1	3093.3	3777.0	4311.4
35–39	1207.0	1383.9	1597.7	1864.5	2172.9	2522.7	2970.1	3619.9
40–44	1014.0	1151.0	1324.6	1526.5	1778.0	2079.8	2410.4	2832.2
45–49	849.0	960.8	1094.7	1257.6	1446.4	1691.0	1974.5	2283.8
50–54	713.0	793.8	902.1	1025.8	1175.8	1358.1	1584.6	1846.1
55–59	586.0	651.6	729.3	826.7	937.5	1080.2	1244.6	1448.2
60–64	466.0	515.6	577.3	644.0	727.4	830.6	953.9	1095.1
65–69	357.0	386.2	431.2	480.8	533.8	608.3	691.7	790.6
70–74	251.0	269.8	295.2	327.9	363.4	407.9	462.5	522.8
75+	231.0	258.7	287.0	313.4	342.9	384.1	427.8	477.7
Total	24472.0	28329.8	33056.9	38509.2	44836.6	52668.4	61699.7	72065.3
Males								
0–4	4678.0	5216.8	6177.0	7170.0	8361.1	10028.6	11672.3	13529.4
5–9	3646.0	4385.7	4927.8	5813.2	6721.9	7897.8	9437.9	10943.0
10–14	3064.0	3580.0	4314.2	4843.1	5708.0	6612.3	7762.1	9267.1
15–19	2595.0	3003.2	3515.2	4232.4	4747.1	5604.8	6487.0	7608.1
20–24	2152.0	2521.7	2925.0	3419.8	4112.8	4623.4	5452.5	6303.7
25–29	1782.0	2076.7	2440.4	2826.7	3300.1	3980.3	4468.0	5261.8
30–34	1495.0	1712.0	2001.7	2348.4	2715.7	3181.0	3830.3	4292.5
35–39	1249.0	1426.5	1639.9	1913.7	2240.9	2601.3	3041.2	3654.9
40–44	1037.0	1179.8	1353.5	1552.5	1807.7	2126.2	2462.6	2872.6
45–49	856.0	966.3	1104.9	1264.5	1446.6	1693.0	1986.3	2294.7
50–54	692.0	781.7	887.6	1012.0	1154.7	1328.8	1550.7	1813.8
55–59	537.0	613.3	697.5	789.4	896.9	1030.3	1181.8	1374.3
60–64	403.0	454.7	523.4	593.0	668.4	765.5	876.0	1000.6
65–69	282.0	318.2	362.5	415.4	468.2	532.9	607.5	691.6
70–74	175.0	200.9	229.4	259.8	295.9	337.5	381.9	432.7
75+	125.0	153.0	182.3	209.5	236.4	272.9	310.0	348.3
Total	24768.0	28590.5	33282.5	38663.4	44882.4	52616.6	61508.2	71689.3
Both sexes	49240.0	56920.3	66339.4	77172.6	89719.0	105285.0	123207.8	143754.5

Source: Author's estimations.

Table A3 High variant midperiod indices for five-year time periods

	1990–95	1995–2000	2000–05	2005–10	2010–15	2015–20	2020–25
Population size	52987.4	61509.7	71619.5	83288.4	97294.6	114011.7	133217.2
Yearly births	2496.6	2902.2	3399.6	4001.3	4711.8	5534.4	6474.6
Yearly deaths	960.5	1018.4	1233.0	1492.0	1598.6	1949.8	2365.3
Net yearly migrants	—	—	—	—	—	—	—
			Yearly rates per thousand population				
GFR	232.5	232.8	232.3	232.7	233.4	233.7	233.5
Birth rate	47.1	47.2	47.5	48.0	48.4	48.5	48.6
Death rate	18.1	16.6	17.2	17.9	16.4	17.1	17.8
Natural increase	29.0	30.6	30.3	30.1	32.0	31.4	30.8
Net migration	—	—	—	—	—	—	—
Population increase	29.0	30.6	30.3	30.1	32.0	31.4	30.8

Note: GFR = gross fertility rate = births per women aged 15–44.

Source: Author's estimations.

Table A4 High variant rates of change in population by age group (per cent per year)

Age	1990–25	1995–2000	2000–05	2005–10	2010–15	2015–20	2020–20
Females							
0–4	2.56	3.33	3.00	3.10	3.59	3.06	2.98
5–9	3.97	2.70	3.26	2.94	3.24	3.51	2.99
10–14	3.25	4.01	2.68	3.24	2.97	3.22	3.50
15–19	2.93	3.29	3.99	2.66	3.28	2.95	3.20
20–24	3.07	2.97	3.27	3.97	2.70	3.26	2.93
25–29	3.06	3.13	2.95	3.24	4.02	2.68	3.23
30–34	2.80	3.12	3.10	2.92	3.30	3.99	2.65
35–39	2.74	2.87	3.09	3.06	2.99	3.26	3.96
40–44	2.53	2.81	2.84	3.05	3.14	2.95	3.23
45–49	2.47	2.61	2.77	2.80	3.13	3.10	2.91
50–54	2.15	2.56	2.57	2.73	2.88	3.09	3.06
55–59	2.12	2.25	2.51	2.52	2.83	2.83	3.03
60–64	2.02	2.26	2.19	2.44	2.65	2.77	2.76
65–69	1.57	2.20	2.18	2.09	2.62	2.57	2.67
70–74	1.45	1.80	2.10	2.06	2.31	2.51	2.45
75+	2.27	2.07	1.76	1.80	2.27	2.15	2.21
Total	2.93	3.09	3.05	3.04	3.22	3.17	3.11
Males							
0–4	2.18	3.38	2.98	3.07	3.64	3.04	2.95
5–9	3.69	2.33	3.30	2.90	3.22	3.56	2.96
10–14	3.11	3.73	2.31	3.29	2.94	3.21	3.54
15–19	2.92	3.15	3.71	2.29	3.32	2.92	3.19
20–24	3.17	2.97	3.13	3.69	2.34	3.30	2.90
25–29	3.06	3.23	2.94	3.10	3.75	2.31	3.27
30–34	2.71	3.13	3.19	2.91	3.16	3.71	2.28
35–39	2.66	2.79	3.09	3.16	2.98	3.12	3.68
40–44	2.58	2.75	2.74	3.04	3.25	2.94	3.08
45–49	2.42	2.68	2.70	2.69	3.15	3.20	2.89
50–54	2.44	2.54	2.62	2.64	2.81	3.09	3.14
55–59	2.66	2.57	2.48	2.55	2.77	2.74	3.02
60–64	2.41	2.82	2.50	2.39	2.71	2.70	2.66
65–69	2.41	2.61	2.72	2.39	2.59	2.62	2.59
70–74	2.76	2.65	2.49	2.60	2.63	2.47	2.49
75+	4.05	3.50	2.78	2.42	2.87	2.55	2.33
Total	2.87	3.04	3.00	2.98	3.18	3.12	3.06
Both sexes	2.90	3.06	3.03	3.01	3.20	3.14	3.08

Note: Change in the flow of individuals reaching a certain age is shown by using the mean age of the population group as a marker; e.g., the row for age 15–19 shows changes in the flow of individuals reaching approximately age 17 (or, if the distribution of population by age is rectangular, age 17.5). The quality of information on rates of increase by age is safeguarded when genuine irregularities of the age distribution at the base date are preserved, while irregularities due to age shifting and heaping are removed.

Source: Author's estimations.

Table A5 High variant proportions of total population by sex (per cent)

Age	1990	1995	2000	2005	2010	2015	2020	2025
Females								
0–4	18.73	18.39	18.61	18.57	18.62	18.96	18.86	18.75
5–9	14.43	15.20	14.91	15.06	14.98	15.00	15.26	15.18
10–14	12.03	12.23	12.81	12.57	12.69	12.54	12.57	12.82
15–19	10.18	10.18	10.28	10.78	10.57	10.60	10.49	10.54
20–24	8.49	8.55	8.51	8.60	9.00	8.77	8.81	8.74
25–29	7.05	7.10	7.11	7.07	7.14	7.43	7.26	7.30
30–34	5.90	5.86	5.87	5.89	5.85	5.87	6.12	5.98
35–39	4.93	4.89	4.83	4.84	4.85	4.79	4.81	5.02
40–44	4.14	4.06	4.01	3.96	3.97	3.95	3.91	3.93
45–49	3.47	3.39	3.31	3.27	3.23	3.21	3.20	3.17
50–54	2.91	2.80	2.73	2.66	2.62	2.58	2.57	2.56
55–59	2.39	2.30	2.21	2.15	2.09	2.05	2.02	2.01
60–64	1.90	1.82	1.75	1.67	1.62	1.58	1.55	1.52
65–69	1.46	1.36	1.30	1.25	1.19	1.16	1.12	1.10
70–74	1.03	.95	.89	0.85	0.81	0.77	0.75	0.73
75+	0.94	0.91	0.87	0.81	0.76	0.73	0.69	0.66
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Males								
0–4	18.89	18.25	18.56	18.54	18.63	19.06	18.98	18.87
5–9	14.72	15.34	14.81	15.04	14.98	15.01	15.34	15.26
10–14	12.37	12.52	12.96	12.53	12.72	12.57	12.62	12.93
15–19	10.48	10.50	10.56	10.95	10.58	10.65	10.55	10.61
20–24	8.69	8.82	8.79	8.84	9.16	8.79	8.86	8.79
25–29	7.19	7.26	7.33	7.31	7.35	7.56	7.26	7.34
30–34	6.04	5.99	6.01	6.07	6.05	6.05	6.23	5.99
35–39	5.04	4.99	4.93	4.95	4.99	4.94	4.94	5.10
40–44	4.19	4.13	4.07	4.02	4.03	4.04	4.00	4.01
45–49	3.46	3.38	3.32	3.27	3.22	3.22	3.23	3.20
50–54	2.79	2.73	2.67	2.62	2.57	2.53	2.52	2.53
55–59	2.17	2.15	2.10	2.04	2.00	1.96	1.92	1.92
60–64	1.63	1.59	1.57	1.53	1.49	1.45	1.42	1.40
65–69	1.14	1.11	1.09	1.07	1.04	1.01	0.99	0.96
70–74	0.71	0.70	0.69	0.67	0.66	0.64	0.62	0.60
75+	0.50	0.54	0.55	0.54	0.53	0.52	0.50	0.49
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Females								
0–14	45.19	45.82	46.33	46.20	46.30	46.50	46.70	46.74
15–64	51.38	50.95	50.60	50.89	50.94	50.84	50.73	50.77
65+	3.43	3.23	3.07	2.91	2.77	2.66	2.56	2.49
Males								
0–14	45.98	46.11	46.33	46.11	46.32	46.64	46.94	47.06
15–64	51.67	51.54	51.35	51.61	51.45	51.19	50.95	50.88
65+	2.35	2.35	2.33	2.29	2.23	2.17	2.11	2.05
Both sexes								
0–14	45.59	45.96	46.33	46.15	46.31	46.57	46.82	46.90
15–64	51.53	51.25	50.98	51.25	51.19	51.01	50.84	50.83
65+	2.89	2.79	2.69	2.60	2.50	2.42	2.34	2.27

Note: 'Both' is calculated from a table for both sexes which is not shown. Males/females: 1990 (1.012), 1995 (1.009), 2000 (1.007), 2005 (1.004), 2010 (1.001), 2015 (.999), 2020 (.997), 2025 (.995).

Source: Author's estimations.

Table A6 Medium variant fertility and mortality projections, 1990–2025

Age	1990.–95	1995–2000	2000–05	2005–10	2010–15	2015–20	2020–25
Fertility[a]							
			Distribution of fertility by age using models (per cent)				
15–19	11.0	11.0	11.0	10.6	10.0	9.1	8.3
20–24	23.2	23.2	23.2	23.7	24.7	25.9	27.0
25–29	24.2	24.2	24.2	24.8	25.8	27.1	28.4
30–34	20.1	20.1	20.1	20.2	20.4	20.6	20.8
35–39	13.6	13.6	13.6	13.2	12.6	11.8	11.1
40–44	6.6	6.6	6.6	6.2	5.5	4.7	3.8
45–49	1.3	1.3	1.3	1.2	1.0	0.7	0.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
			Age-specific fertility schedule				
15–19	0.149	0.143	0.136	0.120	0.101	0.079	0.059
20–24	0.315	0.302	0.287	0.269	0.250	0.222	0.192
25–29	0.328	0.315	0.299	0.281	0.262	0.233	0.202
30–34	0.273	0.261	0.248	0.229	0.207	0.177	0.148
35–39	0.184	0.177	0.168	0.150	0.128	0.102	0.079
40–44	0.089	0.086	0.082	0.070	0.056	0.040	0.027
45–49	0.018	0.017	0.016	0.013	0.010	0.006	0.003
TFR	6.780	6.500	6.180	5.660	5.070	4.300	3.550
GRR	3.340	3.202	3.044	2.788	2.498	2.118	1.749
NRR	2.371	2.349	2.307	2.182	2.013	1.756	1.490
Mean age	28.855	28.855	28.855	28.755	28.582	28.356	28.136
Mortality							
West							
E(0) Females	48.70	50.70	52.70	54.80	56.80	58.80	60.90
E(0) Males	45.40	47.40	49.30	51.30	53.20	55.20	57.20
E(0) Both	47.03	49.03	50.97	53.02	54.97	56.97	59.02
IMR Females	125.79	115.22	105.07	94.91	85.57	76.51	67.33
IMR Males	150.49	138.23	126.63	114.95	104.28	93.45	83.05
IMR Both	138.32	126.89	116.01	105.08	95.06	85.11	75.30
E(5) Females	55.15	56.31	57.41	58.65	59.83	61.02	62.27
E(5) Males	52.78	53.90	54.94	56.05	57.12	58.25	59.40
E(5) Both	53.95	55.09	56.16	57.33	58.46	59.62	60.81

[a] Sex ratio at birth: 103.0 males per 100 females.

Notes: E(0) = life expectancy at birth; E(5) = life expectancy at age 5; IMR = infant mortality rate; TFR = total fertility rate; GRR = gross reproductive rate; NRR = net reproductive rate; mean age = average age of mothers at the birth of their daughters.

Source: Author's estimations.

Table A7 Medium variant population projection, 1990–2025 (millions)

Age	1990	1995	2000	2005	2010	2015	2020	2025
Females								
0–4	4584.0	5208.9	5898.3	6685.5	7375.2	7958.8	8077.3	7888.5
5–9	3531.0	4307.3	4929.2	5622.1	6415.0	7118.8	7724.3	7880.7
10–14	2945.0	3464.1	4233.9	4855.0	5547.8	6340.8	7047.4	7658.7
15–19	2491.0	2883.6	3398.7	4162.2	4782.4	5474.7	6267.8	6978.2
20–24	2078.0	2423.0	2811.6	3321.0	4077.7	4696.3	5388.2	6182.5
25–29	1725.0	2010.1	2350.3	2733.8	3239.1	3988.2	4605.4	5297.7
30–34	1444.0	1661.2	1941.9	2276.7	2657.1	3157.8	3899.5	4516.1
35–39	1207.0	1383.9	1597.7	1873.4	2204.3	2581.0	3077.1	3811.9
40–44	1014.0	1151.0	1324.6	1534.3	1805.6	2131.7	2504.1	2995.4
45–49	849.0	960.8	1094.7	1264.1	1469.5	1735.1	2055.2	2422.4
50–54	713.0	793.8	902.1	1031.8	1196.1	1395.4	1653.6	1966.1
55–59	586.0	651.6	729.3	832.6	956.7	1113.9	1305.4	1554.0
60–64	466.0	515.6	577.3	650.0	746.5	862.7	1010.3	1191.1
65–69	357.0	386.2	431.2	486.5	552.0	638.7	743.7	877.8
70–74	251.0	269.8	295.2	332.7	379.0	434.0	506.9	596.1
75+	231.0	258.7	287.0	319.9	363.8	419.6	488.1	577.1
Total	24472.0	28329.8	32802.9	37981.6	43767.8	50047.7	56354.3	62394.2
Males								
0–4	4678.0	5216.8	5921.9	6721.1	7429.6	8032.8	8170.8	7990.3
5–9	3646.0	4385.7	4927.8	5630.7	6430.9	7148.2	7771.9	7947.6
10–14	3064.0	3580.0	4314.2	4855.0	5556.1	6354.6	7073.3	7700.8
15–19	2595.0	3003.2	3515.2	4242.8	4782.2	5480.6	6277.4	6997.2
20–24	2152.0	2521.7	2925.0	3431.0	4150.2	4687.3	5382.8	6177.5
25–29	1782.0	2076.7	2440.4	2838.4	3338.8	4049.0	4584.9	5278.3
30–34	1495.0	1712.0	2001.7	2359.7	2753.4	3248.4	3951.1	4486.8
35–39	1249.0	1426.5	1639.9	1924.3	2276.9	2665.9	3156.0	3851.5
40–44	1037.0	1179.8	1353.5	1562.4	1841.3	2187.3	2571.2	3055.6
45–49	856.0	966.3	1104.9	1273.5	1477.0	1748.2	2086.0	2462.8
50–54	692.0	781.7	887.6	1020.1	1181.8	1377.3	1638.5	1964.7
55–59	537.0	613.3	697.5	796.4	920.6	1072.4	1257.0	1503.8
60–64	403.0	454.7	523.4	599.2	688.8	801.3	939.7	1108.8
65–69	282.0	318.2	362.5	420.7	485.5	562.6	659.9	780.4
70–74	175.0	200.9	229.4	263.8	309.2	360.3	421.7	499.7
75+	125.0	153.0	182.3	214.0	251.3	298.6	355.3	424.2
Total	24768.0	28590.5	33027.4	38153.0	43873.6	50074.9	56297.6	62230.1
Both sexes	49240.0	56920.3	65830.3	76134.6	87641.4	100122.5	112652.0	124624.3

Source: Author's estimations.

Table A8 Medium variant midperiod indices for five-year time periods (millions)

	1990–95	1995–2000	2000–05	2005–10	2010–15	2015–20	2020–25
Population size	52987.4	61267.3	70857.6	81753.1	93743.5	106264.2	118537.4
Yearly births	2496.6	2782.3	3104.9	3375.6	3595.8	3604.4	3476.7
Yearly deaths	960.5	1000.4	1044.1	1074.3	1099.5	1098.5	1082.2
Net yearly migrants	-	-	-	-	-	-	-
			Yearly rates per thousand population				
GFR	232.5	223.1	211.8	194.7	176.3	150.9	125.2
Birth rate	47.1	45.4	43.8	41.3	38.4	33.9	29.3
Death rate	18.1	16.3	14.7	13.1	11.7	10.3	9.1
Natural increase	29.0	29.1	29.1	28.2	26.6	23.6	20.2
Net migration	-	-	-	-	-	-	-
Population increase	29.0	29.1	29.1	28.2	26.6	23.6	20.2

Note: GFR = gross fertility rate = births per woman ages 15–44.
Source: Author's estimations.

Table A9 **Medium variant rates of change in population by age group** (per cent per year)

Age	1990–95	1995–2000	2000–05	2005–10	2010–15	2015–20	2020–25
Females							
0–4	2.56	2.49	2.51	1.96	1.52	0.30	–0.47
5–9	3.97	2.70	2.63	2.64	2.08	1.63	0.40
0–14	3.25	4.01	2.74	2.67	2.67	2.11	1.66
15–19	2.93	3.29	4.05	2.78	2.70	2.71	2.15
20–24	3.07	2.97	3.33	4.11	2.82	2.75	2.75
25–29	3.06	3.13	3.02	3.39	4.16	2.88	2.80
30–34	2.80	3.12	3.18	3.09	3.45	4.22	2.94
35–39	2.74	2.87	3.18	3.25	3.16	3.52	4.28
40–44	2.53	2.81	2.94	3.26	3.32	3.22	3.58
45–49	2.47	2.61	2.88	3.01	3.32	3.39	3.29
50–54	2.15	2.56	2.69	2.96	3.08	3.40	3.46
55–59	2.12	2.25	2.65	2.78	3.04	3.17	3.49
60–64	2.02	2.26	2.37	2.77	2.89	3.16	3.29
65–69	1.57	2.20	2.41	2.53	2.92	3.04	3.32
70–74	1.45	1.80	2.39	2.61	2.71	3.11	3.24
75+	2.27	2.07	2.17	2.57	2.85	3.03	3.35
Total	2.93	2.93	2.93	2.84	2.68	2.37	2.04
Males							
0–4	2.18	2.54	2.53	2.00	1.56	0.34	–0.45
5–9	3.69	2.33	2.67	2.66	2.11	1.67	0.45
10–14	3.11	3.73	2.36	2.70	2.69	2.14	1.70
15–19	2.92	3.15	3.76	2.39	2.73	2.71	2.17
20–24	3.17	2.97	3.19	3.81	2.43	2.77	2.75
25–29	3.06	3.23	3.02	3.25	3.86	2.49	2.82
30–34	2.71	3.13	3.29	3.09	3.31	3.92	2.54
35–39	2.66	2.79	3.20	3.36	3.15	3.38	3.98
40–44	2.58	2.75	2.87	3.28	3.44	3.23	3.45
45–49	2.42	2.68	2.84	2.96	3.37	3.53	3.32
50–54	2.44	2.54	2.78	2.94	3.06	3.47	3.63
55–59	2.66	2.57	2.65	2.90	3.05	3.18	3.59
60–64	2.41	2.82	2.70	2.79	3.03	3.19	3.31
65–69	2.41	2.61	2.97	2.87	2.95	3.19	3.35
70–74	2.76	2.65	2.80	3.17	3.06	3.15	3.39
75+	4.05	3.50	3.20	3.21	3.45	3.48	3.54
Total	2.87	2.89	2.89	2.79	2.64	2.34	2.00
Both sexes	2.90	2.91	2.91	2.82	2.66	2.36	2.02

Notes: Change in the flow of individuals reaching a certain age is shown by using the mean age of the population group as a marker; e.g., the row for age 15–19 shows changes in the flow of individuals reaching approximately age 17 (or, if the distribution of population by age is rectangular, age 17.5). The quality of information on rates of increase by age is safeguarded when genuine irregularities of the age distribution at the base date are preserved.

Source: Author's estimations.

Table A10 Medium variant proportions of total population by sex (per cent)

Age	1990	1995	2000	2005	2010	2015	2020	2025
Females								
0–4	18.73	18.39	17.98	17.60	16.85	15.90	14.33	12.64
5–9	14.43	15.20	15.03	14.80	14.66	14.22	13.71	12.63
10–14	12.03	12.23	12.91	12.78	12.68	12.67	12.51	12.27
15–19	10.18	10.18	10.36	10.96	10.93	10.94	11.12	11.18
20–24	8.49	8.55	8.57	8.74	9.32	9.38	9.56	9.91
25–29	7.05	7.10	7.17	7.20	7.40	7.97	8.17	8.49
30–34	5.90	5.86	5.92	5.99	6.07	6.31	6.92	7.24
35–39	4.93	4.89	4.87	4.93	5.04	5.16	5.46	6.11
40–44	4.14	4.06	4.04	4.04	4.13	4.26	4.44	4.80
45–49	3.47	3.39	3.34	3.33	3.36	3.47	3.65	3.88
50–54	2.91	2.80	2.75	2.72	2.73	2.79	2.93	3.15
60–64	1.90	1.82	1.76	1.71	1.71	1.72	1.79	1.91
65–69	1.46	1.36	1.31	1.28	1.26	1.28	1.32	1.41
70–74	1.03	0.95	0.90	0.88	0.87	0.87	0.90	0.96
75+	0.94	0.91	0.87	0.84	0.83	0.84	0.87	0.92
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Males								
0–4	18.89	18.25	17.93	17.62	16.93	16.04	14.51	12.84
5–9	14.72	15.34	14.92	14.76	14.66	14.28	13.80	12.77
10–14	12.37	12.52	13.06	12.73	12.66	12.69	12.56	12.37
15–19	10.48	10.50	10.64	11.12	10.90	10.94	11.15	11.24
20–24	8.69	8.82	8.86	8.99	9.46	9.36	9.56	9.93
25–29	7.19	7.26	7.39	7.44	7.61	8.09	8.14	8.48
30–34	6.04	5.99	6.06	6.18	6.28	6.49	7.02	7.21
35–39	5.04	4.99	4.97	5.04	5.19	5.32	5.61	6.19
40–44	4.19	4.13	4.10	4.10	4.20	4.37	4.57	4.91
45–49	3.46	3.38	3.35	3.34	3.37	3.49	3.71	3.96
50–54	2.79	2.73	2.69	2.67	2.69	2.75	2.91	3.16
55–59	2.17	2.15	2.11	2.09	2.10	2.14	2.23	2.42
60–64	1.63	1.59	1.58	1.57	1.57	1.60	1.67	1.78
65–69	1.14	1.11	1.10	1.10	1.11	1.12	1.17	1.25
70–74	0.71	0.70	0.69	0.69	0.70	0.72	0.75	0.80
75+	0.50	0.54	0.55	0.56	0.57	0.60	0.63	0.68
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Females								
0–14	45.19	45.82	45.91	45.19	44.18	42.80	40.55	37.55
15–64	51.38	50.95	51.00	51.81	52.86	54.22	56.37	59.16
65+	3.43	3.23	3.09	3.00	2.96	2.98	3.09	3.29
Males								
0–14	45.98	46.11	45.91	45.10	44.26	43.01	40.88	37.99
15–64	51.67	51.54	51.74	52.55	53.36	54.55	56.56	59.28
65+	2.35	2.35	2.34	2.35	2.38	2.44	2.55	2.74
Both sexes								
0–14	45.59	45.96	45.91	45.14	44.22	42.90	40.71	37.77
15–64	51.53	51.25	51.37	52.18	53.11	54.39	56.47	59.22
65+	2.89	2.79	2.72	2.68	2.67	2.71	2.82	3.01

Source: Author's estimations.

Table A11 Low variant fertility and mortality projections, 1990–2025

Age	1990–95	1995–2000	2000–05	2005–10	2010–15	2015–20	2020–25
Fertility[a]							
	Distribution of fertility by age using models (per cent)						
15–19	11.0	11.0	10.4	9.5	8.8	7.9	7.7
20–24	23.2	23.2	24.0	25.3	26.3	27.6	27.9
25–29	24.2	24.2	25.1	26.5	27.7	29.1	29.4
30–34	20.1	20.1	20.3	20.5	20.7	20.9	21.0
35–39	13.6	13.6	13.1	12.2	11.5	10.7	10.5
40–44	6.6	6.6	6.0	5.1	4.3	3.4	3.2
45–49	1.3	1.3	1.1	0.9	0.6	0.4	0.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Age specific fertility schedule						
15–19	0.149	0.138	0.114	0.089	0.070	0.050	0.037
20–24	0.315	0.291	0.263	0.237	0.211	0.176	0.133
25–29	0.328	0.304	0.275	0.248	0.221	0.185	0.140
30–34	0.273	0.252	0.222	0.192	0.166	0.133	0.100
35–39	0.184	0.171	0.143	0.115	0.092	0.068	0.050
40–44	0.089	0.083	0.066	0.048	0.035	0.022	0.015
45–49	0.018	0.016	0.012	0.008	0.005	0.002	0.001
TFR	6.780	6.280	5.480	4.680	4.000	3.180	2.380
GRR	3.340	3.094	2.700	2.305	1.970	1.567	1.172
NRR	2.371	2.288	2.079	1.844	1.632	1.348	1.044
Mean age	28.855	28.855	28.702	28.468	28.268	28.028	27.975
Mortality							
West							
E(0) Females	48.70	51.20	53.70	56.20	58.70	61.70	64.70
E(0) Males	45.40	47.90	50.40	52.90	55.40	58.40	61.40
E(0) Both	47.03	49.53	52.03	54.53	57.03	60.03	63.03
IMR Females	125.79	112.67	100.23	88.36	76.96	63.92	51.57
IMR Males	150.49	135.18	120.18	105.94	92.39	76.99	62.53
IMR Both	138.32	124.09	110.35	97.28	84.79	70.55	57.13
E(5) Females	55.15	56.58	58.00	59.47	60.96	62.75	64.55
E(5) Males	52.78	54.18	55.55	56.95	58.37	60.09	61.82
E(5) Both	53.95	55.36	56.76	58.19	59.64	61.40	63.17

[a] Sex ratio at birth: 103.0 males per 100 females.

Notes: E(0) = life expectancy at birth; E(5) = life expectrancy at age 5; IMR = infant mortality rate; TFR = total fertility rate; GRR = gross reproductive rate; NRR = net reproductive rate; mean age = average age of mothers at the birth of their daughters.

Source: Author's estimations.

Table A12 Low variant population projection, 1990–2025 (millions)

Age	1990	1995	2000	2005	2010	2015	2020	2025
Females								
0–4	4584.0	5208.9	5723.1	6000.8	6219.5	6432.9	6106.8	5264.4
5–9	3531.0	4307.3	4938.3	5472.5	5782.1	6034.6	6288.2	6008.8
10–14	2945.0	3464.1	4236.1	4868.3	5406.5	5723.6	5986.7	6251.0
15–19	2491.0	2883.6	3400.4	4168.3	4801.5	5343.8	5670.9	5944.8
20–24	2078.0	2423.0	2813.1	3326.8	4090.5	4725.1	5275.4	5614.5
25–29	1725.0	2010.1	2351.7	2739.2	3251.1	4010.7	4650.3	5209.6
30–34	1444.0	1661.2	1943.2	2281.7	2668.1	3178.3	3937.2	4582.6
35–39	1207.0	1383.9	1598.9	1877.8	2214.2	2599.5	3110.5	3869.5
40–44	1014.0	1151.0	1325.7	1538.2	1814.2	2147.9	2533.6	3045.2
45–49	849.0	960.8	1095.6	1267.3	1476.6	1748.8	2080.4	2465.3
50–54	713.0	793.8	903.0	1034.5	1202.2	1407.0	1675.3	2003.5
55–59	586.0	651.6	730.1	835.2	962.2	1124.3	1324.6	1587.4
60–64	466.0	515.6	578.2	652.6	751.9	872.5	1028.2	1221.7
65–69	357.0	386.2	432.0	489.0	557.1	647.9	760.3	906.1
70–74	251.0	269.8	295.9	334.8	383.4	441.9	521.3	620.4
75+	231.0	258.7	288.0	322.9	369.9	430.6	508.1	611.4
Total	24472.0	28329.8	32653.1	37210.1	41950.9	46869.6	51457.9	55206.2
Males								
0–4	4678.0	5216.8	5749.0	6046.4	6287.0	6520.5	6206.2	5362.2
5–9	3646.0	4385.7	4936.3	5485.4	5812.5	6086.1	6361.4	6096.5
10–14	3064.0	3580.0	4316.0	4867.6	5419.2	5752.4	6035.2	6319.8
15–19	2595.0	3003.2	3516.7	4248.2	4800.4	5354.1	5695.1	5986.7
20–24	2152.0	2521.7	2926.6	3436.6	4162.6	4715.7	5274.9	5626.2
25–29	1782.0	2076.7	2442.1	2844.4	3351.5	4072.7	4630.8	5197.9
30–34	1495.0	1712.0	2003.4	2365.6	2766.1	3271.4	3992.2	4557.1
35–39	1249.0	1426.5	1641.4	1929.9	2289.2	2688.4	3195.0	3916.8
40–44	1037.0	1179.8	1355.0	1567.6	1852.8	2208.7	2608.7	3117.0
45–49	856.0	966.3	1106.3	1278.2	1487.4	1767.8	2121.0	2520.5
50–54	692.0	781.7	888.8	1024.2	1191.0	1394.7	1669.8	2017.7
55–59	537.0	613.3	698.5	800.0	928.7	1087.6	1284.3	1550.4
60–64	403.0	454.7	524.3	602.3	695.6	814.3	963.3	1148.7
65–69	282.0	318.2	363.3	423.3	491.3	573.4	679.5	813.7
70–74	175.0	200.9	229.9	265.8	313.7	368.7	436.8	525.5
75+	125.0	153.0	183.0	216.2	256.3	308.2	372.9	454.6
Total	24768.0	28590.5	32880.7	37401.9	42105.1	46984.6	51527.2	55211.3
Both sexes	49240.0	56920.3	65533.9	74612.0	84056.0	93854.3	102985.1	110417.5

Source: Author's estimations.

Table A13 Low variant midperiod indices for five-year time periods (millions)

	1990–95	1995–2000	2000–05	2005–10	2010–15	2015–20	2020–25
Population size	52987.4	61125.9	69974.8	79240.2	88865.1	98349.0	106658.1
Yearly births	2496.6	2689.0	2767.6	2820.8	2872.3	2679.1	2271.9
Yearly deaths	960.5	966.3	952.0	932.0	912.7	853.0	785.4
Net yearly migrants	-	-	-	-	-	-	-
			Yearly rates per thousand population				
GFR	232.5	215.6	188.5	162.2	140.6	113.6	85.0
Birth rate	47.1	44.0	39.6	35.6	32.3	27.2	21.3
Death rate	18.1	15.8	13.6	11.8	10.3	8.7	7.4
Natural increase	29.0	28.2	25.9	23.8	22.1	18.6	13.9
Net migration	-	-	-	-	-	-	-
Pop increase	29.0	28.2	25.9	23.8	22.1	18.6	13.9

Note: GFR = gross fertility rate = births per woman aged 15–44.
Source: Author's estimations.

Table A14 Low variant rates of change in population by age group (per cent per year)

Age	1990–95	1995–2000	2000–05	2005–10	2010–15	2015–20	2020–25
Females							
0–4	2.56	1.88	0.95	0.72	0.67	–1.04	–2.97
5–9	3.97	2.73	2.05	1.10	0.85	0.82	–0.91
10–14	3.25	4.02	2.78	2.10	1.14	0.90	0.86
15–19	2.93	3.30	4.07	2.83	2.14	1.19	0.94
20–24	3.07	2.99	3.35	4.13	2.88	2.20	1.25
25–29	3.06	3.14	3.05	3.43	4.20	2.96	2.27
30–34	2.80	3.14	3.21	3.13	3.50	4.28	3.04
35–39	2.74	2.89	3.22	3.30	3.21	3.59	4.37
40–44	2.53	2.83	2.97	3.30	3.38	3.30	3.68
45–49	2.47	2.63	2.91	3.06	3.38	3.47	3.40
50–54	2.15	2.58	2.72	3.00	3.15	3.49	3.58
55–59	2.12	2.27	2.69	2.83	3.11	3.28	3.62
60–64	2.02	2.29	2.42	2.83	2.97	3.29	3.45
65–69	1.57	2.24	2.48	2.61	3.02	3.20	3.51
70–74	1.45	1.84	2.47	2.71	2.84	3.30	3.48
75+	2.27	2.14	2.29	2.72	3.04	3.31	3.70
Total	2.93	2.84	2.61	2.40	2.22	1.87	1.41
Males							
0–4	2.18	1.94	1.01	0.78	0.73	–0.99	–2.92
5–9	3.69	2.37	2.11	1.16	0.92	0.88	–0.85
10–14	3.11	3.74	2.41	2.15	1.19	0.96	0.92
15–19	2.92	3.16	3.78	2.44	2.18	1.24	1.00
20–24	3.17	2.98	3.21	3.83	2.49	2.24	1.29
25–29	3.06	3.24	3.05	3.28	3.90	2.57	2.31
30–34	2.71	3.14	3.32	3.13	3.36	3.98	2.65
35–39	2.66	2.81	3.24	3.41	3.21	3.45	4.07
40–44	2.58	2.77	2.91	3.34	3.51	3.33	3.56
45–49	2.42	2.71	2.89	3.03	3.45	3.64	3.45
50–54	2.44	2.57	2.84	3.02	3.16	3.60	3.79
55–59	2.66	2.60	2.71	2.98	3.16	3.32	3.77
60–64	2.41	2.85	2.77	2.88	3.15	3.36	3.52
65–69	2.41	2.65	3.06	2.98	3.09	3.40	3.60
70–74	2.76	2.70	2.90	3.31	3.23	3.39	3.70
75+	4.05	3.57	3.34	3.40	3.69	3.81	3.96
Total	2.87	2.80	2.58	2.37	2.19	1.85	1.38
Both sexes	2.90	2.82	2.59	2.38	2.21	1.86	1.39

Notes: Changes in the flow of individuals reaching a certain age is shown by using the mean age ofthe population group as a marker; e.g., the row for age 15–19 shows changes in the flow of individuals reaching approximately age 17 (or, if the distribution of population by age is rectangular, age 17.5). The quality of information on rates of increase by age is safeguarded when genuine irregularities of the age distribution at the base date are preserved.

Source: Author's estimations.

Table A15 Low variant proportions of total population by sex (percent)

Age	1990	1995	2000	2005	2010	2015	2020	2025
Females								
0–4	18.73	18.39	17.53	16.13	14.83	13.73	11.87	9.54
5–9	14.43	15.20	15.12	14.71	13.78	12.88	12.22	10.88
10–14	12.03	12.23	12.97	13.08	12.89	12.21	11.63	11.32
15–19	10.18	10.18	10.41	11.20	11.45	11.40	11.02	10.77
20–24	8.49	8.55	8.61	8.94	9.75	10.08	10.25	10.17
25–29	7.05	7.10	7.20	7.36	7.75	8.56	9.04	9.44
30–34	5.90	5.86	5.95	6.13	6.36	6.78	7.65	8.30
35–39	4.93	4.89	4.90	5.05	5.28	5.55	6.04	7.01
40–44	4.14	4.06	4.06	4.13	4.32	4.58	4.92	5.52
45–49	3.47	3.39	3.36	3.41	3.52	3.73	4.04	4.47
50–54	2.91	2.80	2.77	2.78	2.87	3.00	3.26	3.63
55–59	2.39	2.30	2.24	2.24	2.29	2.40	2.57	2.88
60–64	1.90	1.82	1.77	1.75	1.79	1.86	2.00	2.21
65–69	1.46	1.36	1.32	1.31	1.33	1.38	1.48	1.64
70–74	1.03	0.95	0.91	0.90	0.91	0.94	1.01	1.12
75+	0.94	0.91	0.88	0.87	0.88	0.92	0.99	1.11
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Males								
0–4	18.89	18.25	17.48	16.17	14.93	13.88	12.04	9.71
5–9	14.72	15.34	15.01	14.67	13.80	12.95	12.35	11.04
10–14	12.37	12.52	13.13	13.01	12.87	12.24	11.71	11.45
15–19	10.48	10.50	10.70	11.36	11.40	11.40	11.05	10.84
20–24	8.69	8.82	8.90	9.19	9.89	10.04	10.24	10.19
25–29	7.19	7.26	7.43	7.60	7.96	8.67	8.99	9.41
30–34	6.04	5.99	6.09	6.32	6.57	6.96	7.75	8.25
35–39	5.04	4.99	4.99	5.16	5.44	5.72	6.20	7.09
40–44	4.19	4.13	4.12	4.19	4.40	4.70	5.06	5.65
45–49	3.46	3.38	3.36	3.42	3.53	3.76	4.12	4.57
50–54	2.79	2.73	2.70	2.74	2.83	2.97	3.24	3.65
55–59	2.17	2.15	2.12	2.14	2.21	2.31	2.49	2.81
60–64	1.63	1.59	1.59	1.61	1.65	1.73	1.87	2.08
65–69	1.14	1.11	1.10	1.13	1.17	1.22	1.32	1.47
70–74	0.71	0.70	0.70	0.71	0.74	0.78	0.85	0.95
75+	0.50	0.54	0.56	0.58	0.61	0.66	0.72	0.82
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Females								
0–14	45.19	45.82	45.62	43.92	41.50	38.81	35.72	31.74
15–64	51.38	50.95	51.27	53.00	55.38	57.94	60.80	64.38
65+	3.43	3.23	3.11	3.08	3.12	3.24	3.48	3.87
Males								
0–14	45.98	46.11	45.62	43.85	41.61	39.07	36.10	32.20
15–64	51.67	51.54	52.02	53.73	55.87	58.26	61.01	64.55
65+	2.35	2.35	2.36	2.42	2.52	2.66	2.89	30.25
Both sexes								
0–14	45.59	45.96	45.62	43.88	41.55	38.94	35.91	31.97
15–64	51.53	51.25	51.64	53.37	55.63	58.10	60.90	64.47
65+	2.89	2.79	2.73	2.75	2.82	2.95	3.18	3.56

Source: Author's estimations.

References

Dawit Wolde-Giorgis, 1987. 'Let them eat dust', *Africa Events*, August:16–21.

Economic Commission for Africa (ECA), 1985. *Report of the Regional Training Workshop on Demographic Estimates and Projection in Africa*, Vol. 2, RAF/84, Regional Institute for Population Studies, Accra.

Ethiopia, Central Statistical Authority, 1991. *The 1984 Population and Housing Census of Ethiopia*, Addis Ababa.

Eritrea, Provisional Government, 1993. *Eritrea: Birth of a Nation—Brief Overview*, Department of External Affairs, Asmara, March.

Family Guidance Association of Ethiopia, 1986. *Commemorating the 20th Anniversary of FGAE, 1966–1986*, Family Guidance Association of Ethiopia, Addis Ababa.

Haub, C., 1987. 'Understanding population projections', *Population Bulletin*, 42(4):3–43.

Nag, M., 1989. 'Political awareness as a factor in accessibility of health services: a case study of rural Kerala and West Bengal', paper presented at the Health Transition Workshop on Cultural, Social and Behavioural Determinants of Health: What is the Evidence?, 15–19 May 1989, The Australian National University, Canberra.

Shorter, F.C., and Pasta, D., 1991. 'FIVFIV population projection package, release 10.0', *Computational Methods for Population Projections: with particular reference to development planning*, Population Council, New York.

Tesfaghiorghis, H., 1985. *Population projections for Ethiopia, 1985–2000*, Central Statistical Authority, Addis Ababa.

——— 1990. Fertility and Infertility in Ethiopia, The Australian National University, Canberra, PhD Thesis.

United Nations, 1989. *Review of Recent National Demographic Target Setting*, ST/ESA/SER.A/108, United Nations, New York.

——— 1990. *World Population Monitoring 1989. Special Report: the population situation in the least developed countries*, ST/ESA/SER.A/113, United Nations, New York.

——— 1991a. *World Population Prospects 1990*, ST/ESA/SER.A/106, United Nations, New York.

——— 1991b. *The Sex and Age Distribution of Population: the 1990 revision*, ST/ESA/SER.A/122, United Nations, New York.

——— 1991c. *Concise Report on the World Population Situation in 1991. With a Special Emphasis on Age Structure*, ST/ESA/SER.A/124, United Nations, New York.

United Nations Children's Fund, 1992. *The State of the World's Children 1992*, Oxford University Press, New York.

World Bank, 1985. *Sector Review, Ethiopia: population, health and nutrition*, World Bank, Oxford University Press, New York.

——— 1991. 'The challenge of development', *World Development Report 1991*, World Bank, Oxford University Press, New York.

Recent publications on development

Economics Division Working Papers

ISSN 1038-412x

Development issues

DI93/5 *Coordination of human resource development policymaking, planning and implementation*, Lorraine Corner, 26 pp.

DI 93/4 *Exchange rate regimes and outaard looking growth*, E.S. Leung, 39 pp.

DI 93/3 *The population in Ethiopia, 1990–2025: possibilities for the future*, Zemicael Desta, 38 pp.

DI 93/2 *Foreign direct investment in developing economies: the changing ethos*, Dilip Das, 24 pp.

DI 93/1 *Frontier economics: efficiency of firm performance with technological change*, R.T. Shand and K.P. Kalirajan, 88 pp.

DI 92/4 The *labour allocation in multi-worker family enterprises: Bangladesh*, R. Islam Rahman, 22 pp.

DI 92/3 *Production technology and allocation decisions in Bangladesh agriculture*, Umme Salma, 30 pp.

DI 92/2 *India's social forestry program*, Michael Burgess, 11 pp.

DI 92/1 *The political economy of regionalism and developing countries*, David Robertson, 33 pp.

East Asia

EA93/6 *Reforming centrally planned foreign trade systems: Chinese experiences*, Zhang Xiao Guang, 36 pp.

EA 93/5 *Expanding the scope of human capital theory: explaining wages in the Chinee rural industrial sector*, Bob Gregory and Xin Ming, 34 pp.

EA 93/4 *Is there an East Asian model?*, Helen Hughes, 30 pp.

EA 93/3 *Production initiatives in China's semi-marketized farming sector*, Yiping Huang, 22 pp.

EA 93/2 *Taxation and industrial financing of China's state-owned enterprises*, Cao Yong, 22 pp.

EA 93/1 *Determination and discrimination: female wages in China's rural TVP industries*, Meng Xin, 30 pp.

EA 92/6 *The East Asian steel industry*, Peter Drysdale (ed.), 102 pp.

EA 92/5 *The impact of partial market mechanisms on the Chinese iron and steel industry*, Cao Yong, 40 pp.

EA 92/4 *Are anti-dumping duties effective? The case of the China Steel Corporation*, Han Herderschee, 10 pp.

EA 92/3 *The MFA, world markets and East Asian exporters*, Yongzheng Yang, 34 pp.

EA 92/2 *Korean economy: prospects and financial reforms*, Duk-Hoon Lee, 28 pp.

EA 92/1 *The external policy of Korea*, Duk-Hoon Lee, 20 pp.

Southeast Asia

SA 93/6 *Costs and benefits of water supply technologies in rural Indonesia: evidence from Nusa Tenggara Barat*, Frances Perkins, 40 pp.

SA 93/5 *Indonesian health policy into the twenty-first century: the role of demand*, Lorraine Corner and Yulfita Rahardjo, 34 pp.

SA 93/4 *Southeast Asian economic development: an analytical survey*, Hal Hill, 104 pp.

SA 93/3 *Impact of multi-fibre arrangement on Indonesian clothing exports: a multi-country trade model*, Ilyas Saad, 46 pp.

SA 93/2 *The 'colonial drain' from Indonesia, 1823–1990*, Pierre van der Eng, 52 pp.

SA 93/1 *Food consumption and the standard of living in Indonesia, 1880–1990*, Pierre van der Eng, 64 pp.

SA 92/3 *Macroeconomic instability and growth in the Philippines: a dynamic approach*, Myrna S. Austria and Will Martin, 24 pp.

SA 92/2 *Exports, technological progress and growth: the use of panel data*, Myrna S. Austria, 28 pp.

SA 92/1 Economic *reform and development in Vietnam*, Le Dang Doanh, 16 pp.

(The above working papers are A$8.00 including postage)

Asian-Pacific Economic Literature

H.W. Arndt (editor)

ISSN 0818-9935

Vol 7, No. 2 November 1993
Surveys on: *International labour migration in the Asian–Pacific* region ◦ *Productive efficiency in Chinese industry*

Vol. 7, No. 1 May 1993
Surveys on: *Saving behaviour* ◦ *Civil service pay* ◦ *Social security.* Policy article on: *Textile trade*

Subscriptions
(2 issues, including airmail postage)

Institutional price	A$100 US$75
Developing countries/ Personal price	A$50 US$40

Available from Biblioech
(order form at the end of this list)

Asia-Pacific Profiles 1993

A comprehensive source of data on the region, including key economic indicators, foreign investment.

- 300 pages with up-to-date statistics on GDP growth ◦ prices ◦ inflation rates ◦ exchange rates ◦ export and import trends ◦ trade flows ◦ capital flows ◦ social and political indicators ◦ savings and investment
- for China ◦ Hong Kong ◦ Indonesia ◦ Japan ◦ Korea ◦ Malaysia ◦ Papua New Guinea and the South Pacific ◦ Philippines ◦ Singapore ◦ Taiwan ◦ Thailand ◦ Vietnam ◦ Australia and New Zealand

Air express courier cost is included in the price per volume.

Within Australia	A$500.00
Overseas	US$500.00

Update 93 includes critical evaluation of Australia's economic and trade performance in East Asia as well as the individual economies of the region and Asia–Pacific diplomacy including NAFTA, and the Seattle APEC meeting.

A$50 to *Profiles* subscribers
A$100 if bought indiviudally

Asia-Pacific Economics group: Professors Ross Garnaut, Peter Drysdale and Helen Hughes. The Profile 1993 team is led by Ross Garnaut. Maree Tait is the editor.

National Centre for Development Studies

Books

NC 7 *The European Community and the Developing World*, Enzo R. Grilli, 1992.
Cambridge University Press, Sydney
387 pp. ISBN 0 521 38511 3 A$65.00

NC 6 *Disarray in World Food Markets: a quantitative assessment*,
Rodney Tyers and Kym Anderson, 1992.
Cambridge University Press, Sydney
444 pp. ISBN 0 521 35105 7 A$59.95

NC 5 *The China–Hong Kong Connection: the key to China's open door policy*, Yun-Wing Sung, 1991.
Cambridge University Press, Sydney
198 pp. ISBN 0 521 38245 9 A$45.00

NC 4 *New Silk Roads*, Kym Anderson (ed.), 1992.
Cambridge University Press, Sydney
272 pp. ISBN 0 521 39278 0 A$59.50

NC 3 *Authority and Academic Scribblers: the role of research in East Asian policy reform*, Sylvia Ostry (ed.), October 1991.
International Center for Economic Growth, ICS Press, San Francisco, 181 pp.
ISBN 1 55815 133 8 (cloth)
ISBN 1 55815 132 X (paper)
Executive summary A$2.00 cloth A$24.95 paper A$12.95

NC 2 *Achieving Industrialization in East Asia*, Helen Hughes (ed.), 1988.
Cambridge University Press, Sydney
396 pp. ISBN 0 521 35129 4 A$65.00

NC 1 *Unity and Diversity: regional economic development in Indonesia since 1970*,
Hal Hill (ed.), 1989.
Oxford University Press, Singapore
610 pp. ISBN 0 19 588921 5 A$35.00
paper A$24.95

NCDS Working Papers

ISSN 0815–7596

DS 91/16 *Environment, GATT and developing countries*, David Robertson, 32 pp.

DS 91/15 *A portfolio balance model of a managed exchange rate: the Australian case*, Suiwah Leung, 61 pp.

DS 91/14 *The Asian model*, Helen Cabalu, Jytte Laursen, David Pearce, David Vincent and Mai Yinhau, 73 pp.

DS 91/13 *Growth of Singapore: an external view*, Helen Hughes, 19 pp.

DS 91/12 *Poverty and government policy in Thailand*, Suphat Suphachalasai and Direk Patmasiriwat, 33 pp.

DS 91/11 *Protection and exports: a comparison of Taiwan and Thailand*, Han Herderschee, 15 pp.

DS 91/10 *Incentives for exports: the case of Thailand*, Han Herderschee, 20 pp.

DS 91/9 *Incentives for exports: the case of Taiwan*, Han Herderschee, 16 pp.

DS 91/8 *Modelling steady state forestry in a CGE context*, Philippa S. Dee, 67 pp.

DS 91/7 *The economic consequences of saving Indonesia's forests*, Philippa S. Dee, 35 pp.

DS 91/6 *A dynamic approach to estimating inter-fuel substitution in Japanese energy demand*, Frances Perkins, 35 pp.

DS 91/5 *The impact of Japanese government energy policies on fuel switching and conservation: a dynamic approach*, Frances Perkins, 31 pp.

DS 91/4 *Wage determination in low income surplus labour economies: a review of theories and evidence*, Rushidan Islam Rahman, 25 pp.

DS 91/3 *Developing countries and the trading system in the 1990s*, David Robertson, 20 pp.

DS 91/2 *Poor women's access to economic gains from Grameen Bank loans*, Rushidan Islam Rahman, 19 pp.

DS 91/1 *Labour supply functions and the determinants of employment in a labour surplus situation: insights from an analysis of female wage workers in rural Bangladesh*, Rushidan Islam Rahman, 13 pp.

(The above working papers are A$7.00 each including postage)

China Working Papers

ISSN 1030-360X

CH 91/9 The *Huli Zone: a cost-benefit analysis*, Lin Shujuan, 26 pp. (in Chinese)

CH 91/8 *China's clothing and textile exports: demand or supply constrained?* Yongzheng Yang, 37 pp.

CH 91/7 *Special economic zones in China: the administrative and regulatory framework*, David Wall, 27 pp.

CH 91/6 *The impact of economic reform on productivity growth in Chinese industry: the case of Xiamen's special economic zone*, Frances Perkins, 54 pp.

CH 91/5 *Poverty in China*, Tong Ya-ming, 24 pp.

CH 91/4 *Estimation of the shadow price of labour in China*, Lin Shujuan, 16 pp.

CH 91/3 *Shadow price of capital in China*, Lin Shujuan, 31 pp.

CH 91/2 *Improving infrastructure: a cost–benefit analysis of the economic performance of special economic zones in China: the case of the Huli zone*, Lin Shujuan, 36 pp.

CH 91/1 *Reforming the agricultural sector in China*, Justin Yifu Lin, 26 pp.

(The above working papers are A$7.00 each including postage)

Chinese Students' Conference Proceedings

CPRO 3 *Trade, Investment and Economic Prospects in China's Three Economies*
Papers from a workshop held at Monash University on the 24–26 February 1992, Chinese Students' Society for Economic Studies (Australia), 1993.
180 pp. ISBN 0 7315 1673 7 A$15.00

CPRO 2 *China: trade and reform*
Papers from a workshop held at Macquarie University on 15–16 November 1990, Chinese Students' Society for Economic Studies (Australia), 1991.
244 pp. ISBN 0 7315 0933 1 A$15.00

CPRO 1 *Economic issues in China*
Papers from a workshop held in Canberra on 20–21 September 1989, Chinese Students' Society for Economic Studies (Australia), 1989.
267 pp. ISBN 0 7315 0686 3 A$10.00

Australia–Japan Research Centre

Monographs

AJC15 *Pacific Coal Trade in the 1990s: energy or environmental priorities*, Paul Parker (ed.), 154 pp., ISBN 0 86413 139 9, A$25.00 paperback.

AJC14 *Pacific Dynamism and the International Economic System*, C. Fred Bergsten and Marcus Noland (eds), 400pp. ISBN 0 88132 196 6, A$35.j95 paperback.

AJC13 *International Adjustment and the Japanese Firm*, Paul Sheard (ed.), 1992.
251 + xii pp. ISBN 1 86373 418 X, ISBN 1 86373 417 1 (pbk.),
A$49.95 hardcover/A$29.95 paperback.

AJC 12 *Japanese Financial Markets and the Role of the Yen*, Colin McKenzie and Michael Stutchbury (eds), 1992.
173 pp. ISBN 1 86373 240 3, ISBN 1 86373 239 X (pbk.),
A$39.95 hardcover/A$24.95 paperback.

AJC11 *Economic Reform and Internationalisation: China and the Pacific region*, Ross Garnaut and Liu Guoguang (eds), 1992.
403 + xv pp. ISBN 1 86373 335 3, ISBN 86873 328 0 (pbk.), A$44.95 hardcover/A$29.95 paperback.

AJC10 *Japanese Tourism to Australia*, Australia-Japan Research Centre, 1992.
17 + vi pp. ISBN 0 84613 132 1, A$20.00.

AJC 9 *Challenges of Economic Reform and Industrial Growth: China's wool war*, Christopher Findlay (ed.), 1992.
239 + xiv pp. ISBN 1 86373 203 9, A$45.00 hardcover / ISBN 1 86373 204 7, A$29.95 paperback.

AJC 8 *Japan's Foreign Exchange Policy 1971–82*, Ryutaro Komiya and Miyako Suda. Colin McKenzie (translation ed.), 1992.
378 pp. ISBN 1 86373 009 5, A$49.95 hardcover / ISBN 0 04 442352 7, A$29.95 paperback.

AJC 7 *The Pacific Economy: growth and external stability*, Mohamed Ariff (ed.), 1992.
312 + xvi pp. ISBN 1 86373 036 2, A$44.95 hardcover/ ISBN 1 86373 035 4, $29.95 paperback.

AJC 6 *The Soviets and the Pacific Challenge*, Peter Drysdale (ed.), 1991.
160 + xxii pp. ISBN 1 86373 011 7, A$34.95 hardcover. ISBN 1 86373 010 9, A$17.95 paperback.

AJC 5 *Technological Challenge in the Asia-Pacific Economy*, Hadi Soesastro and Mari Pangestu (eds), 1990.
371 + xiii pp. ISBN 0 04 442229 6, A$34.95 paperback.

AJC 4 *The Australia-Japan Relationship: towards the year 2000*, Peter Drysdale, Nancy Viviani, Akio Watanabe and Ippei Yamazawa, 1989.
91 pp. ISBN 0 86413 079 1, A$20.00 paperback. $10.00 students.

AJC 3 *Australia and the Northeast Asian Ascendancy*, Ross Garnaut, 1989.
339 + xvii pp. ISBN 0 644 10909 2, A$29.95 paperback.

AJC 2 *International Economic Pluralism: economic policy in Asia and the Pacific*, Peter Drysdale, 1988.
294 pp. ISBN 0 04 335062 3, $39.95 hardcover / ISBN 0 04 350075 7, A$27.50 paperback.

AJC 1 *Proceedings of the Seventh Biennial Conference of the Japanese Studies Association of Australia, 1991*
Volume 1: *Japan and the World*, 229 pp.
ISBN 0 86413 110 0.
Volume 2: *Social, Political and Economic Change*

in Japan, 211 pp. ISBN 0 86413 111 9.
Volume 3: *Japanese Language and Studies in Australia*, 283 pp. ISBN 0 86413 112 7.
Available by volume for A$39.00
or by set of three volumes for A$110.00.

Pacific Economic Papers

ISSN 0728-8409

PEP 224 *Asia Pacific economic cooperation and Australia–Japan relations: a Japanese perspective*, Masatoshi Incuchi and Takashi Terada, 1993.

PEP 223 *Japanese direct foreign investment in Australia in comparative perspective*, Peter Drysdale, 1993.

PEP 222 *Exchange rate changes and export pricing behaviour in Japan*, Premachandra Athukorala and Jayant Menon, August 1993.

PEP 221 *General revenue grants and the flypaper effect: the Japanese case*, Kiyohito Hanai, July 1993.

PEP 220 *Information services, private bureaucracies, and Japan's comparative advantage*, Englebrecht, June 1993.

PEP 219 *Australia–Japan Business Cooperation Committees: forging channels of communication*, Kamada, May 1993.

PEP 218 *Production and development systems in the Japanese wool textile and apparel industry*, Fujimoto and Asaba, April 1993.

PEP 217 *The challenge of the appreciating yen and Japanese corporate response*, Dilip Das, March 1993.

PEP 216 *The outlier: Chinese steel industry development and prospects for trade*, Lintong Feng, Christopher Findlay, Hugh Richardson andYanrui Wu, February1993.

PEP 215 *Rice liberalisation and Japan's role in the Uruguay Round: a two-level game approach*, Aurelia George and David Rapkin, January 1993.

PEP 214 *China and the international trading system*, Peter Drysdale and Andrew Elek, December 1992.

PEP 213 *Concepts and objectives of Pacific Economic Cooperation*, Stuart Harris, November 1992.

PEP 212 *The 1971–72 Senate hearings on Japan: Sir John Crawford's evidence on the Australia–Japan relationship*, Alan Rix, October 1992.

PEP 211 *An analysis of recent developments in the Japanese money market*, Gordon de Brouwer, September 1992.

PEP 210 *Job security and employment adjustment: a US–Japan comparison*, Hong Tan and Atsushi Seike, August 1992.

PEP 209 *Trade policy options for the Asia–Pacific region in the 1990s: the potential of open regionalism*, Andrew Elek, July 1992.

PEP 208 *Economic reform and internationalisation: China and the Pacific region: summary and overview*, Stephen Howes and Alan Bollard, June 1992.

PEP 207 *Information specialisation and trade: trading companies and the coal trade of Europe and Japan*, Paul Parker, May 1992.

PEP 206 *Textiles and clothing in global economic development: East Asia's dynamic role*, Kym Anderson, April 1992.

PEP 205 *The economics of Japanese corporate organisation and the 'structural impediments' debate: a critical review*, Paul Sheard, March 1992.

PEP 204 *Linking environment policy and energy technology to coal trade: Japan and the Pacific Coal Flow Expansion Initiative*, Paul Parker, February 1992.

PEP 203 *Pacific rim coking coal trade*, Richard Koerner, January 1992.

Annual subscription rate for twelve issues:
Individuals A$40.00, Institutions A$100.00
Cost for single issues: A$15.00
Students: A$10.00

Orders

Books, journals and working papers (with the exception of the APEL journal) are available from **Bibliotech,** Reply Paid 440, Canberra ACT 0200, Australia (a FAX order follows). Standing orders for series and journals are available—insert 'SO' in the quantity column and we will invoice you.
A postage and packing charge is added to the cost of books as follows:

Australia:
1st book $4.80, each additional book $3.00

Airmail:

Asia/Oceania:	1st book A$7.80
	each additional book A$4.00
Elsewhere:	1st book A$11.70
	each additional book A$8.50

Publications are available at 40 per cent off list price to students with proof of full-time study (e.g.copy of student card).

ECONOMICS DIVISION
Research School of Pacific Studies, Australian National University

FAX ORDER

Fax number:	**(+61-6) 257 5088**
To:	**Bibliotech, ANUTECH Pty Ltd**
Attention:	**Jessica Radnell, Manager**

From:

Organization:

Telephone: Fax:

Address:

Code	Author/short title of publication/series	Qty	Price/copy	Total price
		Postage and packing		
		Total		

Charge my
Mastercard ☐ Visa ☐ American Express ☐ Bankcard ☐

Number ..... Expiry date .....

Name ..... Signature .....

To pay by cheque or bankdraft please forward to:
Reply Paid 440 Bibliotech GPO Box 4 Canberra ACT 2601 Australia

Economics Division Working Papers are divided into streams

- **Development Issues**
- **East Asia**
- **Southeast Asia**
- **South Pacific**

Working Papers A$8.00 including postage

Order from:

Reply Paid 440
Bibliotech
ANUTECH Pty Ltd
Canberra 0200
Australia

Tel: (61 6) 249 5662
Fax: (61 6) 249 5088