

Is progress in education sustainable?**Abstract**

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. Population projections by level of education allow us to have a precise knowledge not only about the combined momentum of population growth and education spread but also on the actual number of in-school or potentially in-school population by levels of education and this 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 increasing school-age population and increases in enrollment 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.

Is progress in education sustainable?

Anne Goujon¹

Introduction

Education comes very strong in the international studies of the determinants of population growth. In the early days of development theory in the sixties and early seventies, population was considered like a bomb whose explosion could have disastrous Malthusian effect like famines and poverty. Then came a less panicky approach that put emphasis on the necessity to facilitate economic growth with the motto that “development is the best contraceptive”. However disillusion came fast and economic growth was shown to have little to do with improvements in quality of life and therefore the call for economic growth was supplemented by social development that emphasize direct action in field such as public health, education and literacy, and social security. Empirical experience substantiates this view that social development contributed to better quality of life and reduced population growth when combined with successful family planning initiatives.

The future course of fertility depends crucially on progress in human development, and in particular in improvements in health and education. Bongaarts (2002) finds through regression analysis that these two variables were and still are the “most critical determinant of progress through the fertility transition”. Hence, future levels of educational attainment will be important for the decline of population growth in developing countries.

The significance of human resource development supported by education and training is manifest. It contributes to medium term institution building, is an essential complement to many investments in physical infrastructure, and is an integral part of any definition of development that sees access to educational services of appropriate quality as a basic human right. In order to improve the planning of educational assistance it is necessary to take a view on some of the major factors that will shape educational development over the near to medium future.

In trying to evaluate the impacts of human capital stocks and accumulation on economic growth, Gemmel (1996) demonstrates that the use of school enrolment rates (or literacy rates) as human capital measures cannot distinguish between stock and accumulation effects which information on educational attainment of the population can provide. As well his results suggest that human capital effects on growth are most evident at the primary and secondary in low and higher-income less developed countries respectively but at the tertiary level in developed countries.

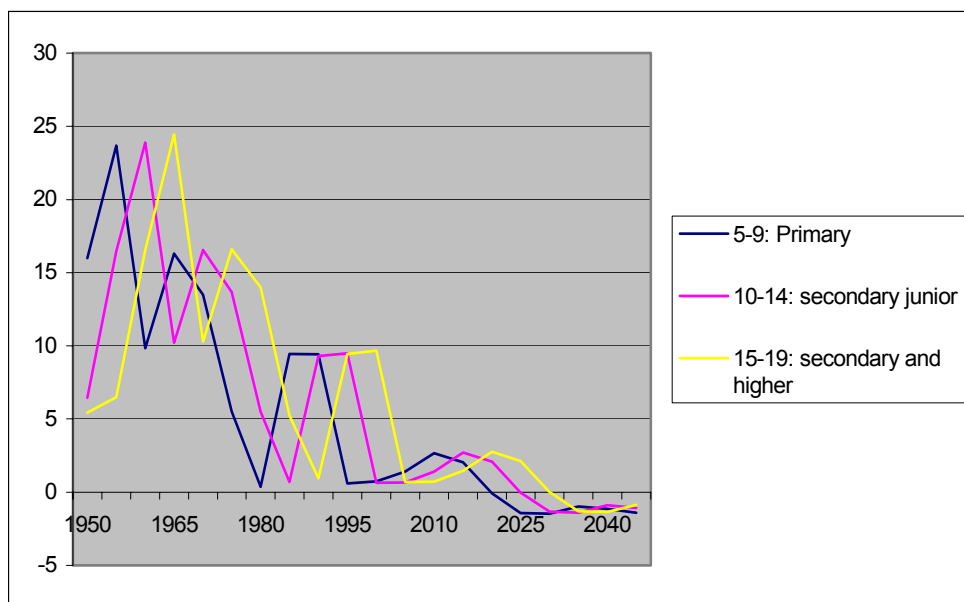
Planning for education was and continues to be almost exclusively focused on the educational sector (see UNESCO enrolment projections). Educational planners rarely look beyond this sector with the view to assessing the implications of their plans for other sectors or the society at large. In particular, 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

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knowledge of the individuals of the society (Macura, 1989). The standard cohort component method of population projections 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.

International organizations have been setting goals to reduce misery and poverty, where since the 1990s education has more and more become an instrument to achieve these development objectives e.g. see ICPD (International Conference on Population and Development) and MDG (Millennium Development Goals). The objectives 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 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 group 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 developed 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 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.

Figure 1. Five-year period growth rates (in percent) 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)



Projections of levels of educational attainment provide a useful tool to gain information on the level of educational attainment at any level desired. We show for instance in this paper possible applications to world regions, countries or sub-national areas like administrative State. This in return provides useful insights on the future human capital composition of the area, on the potential impact of education on the fertility of the area, on the chances of certain social behavior to appear or not, like environmental education or paper consumption 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. Hence they reflect the momentum of education and population trends, and include the changes in age structure.

Methodology

The multi-state population projection method allows 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.

An example of world regions

This section 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 is 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 scenario² and the ICPD scenario³ from 2000 to 2030. Special attention is paid to 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:

² The “Constant enrollment 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 central scenario (Lutz and Goujon, 2001).

³ The 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 enrollment 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).

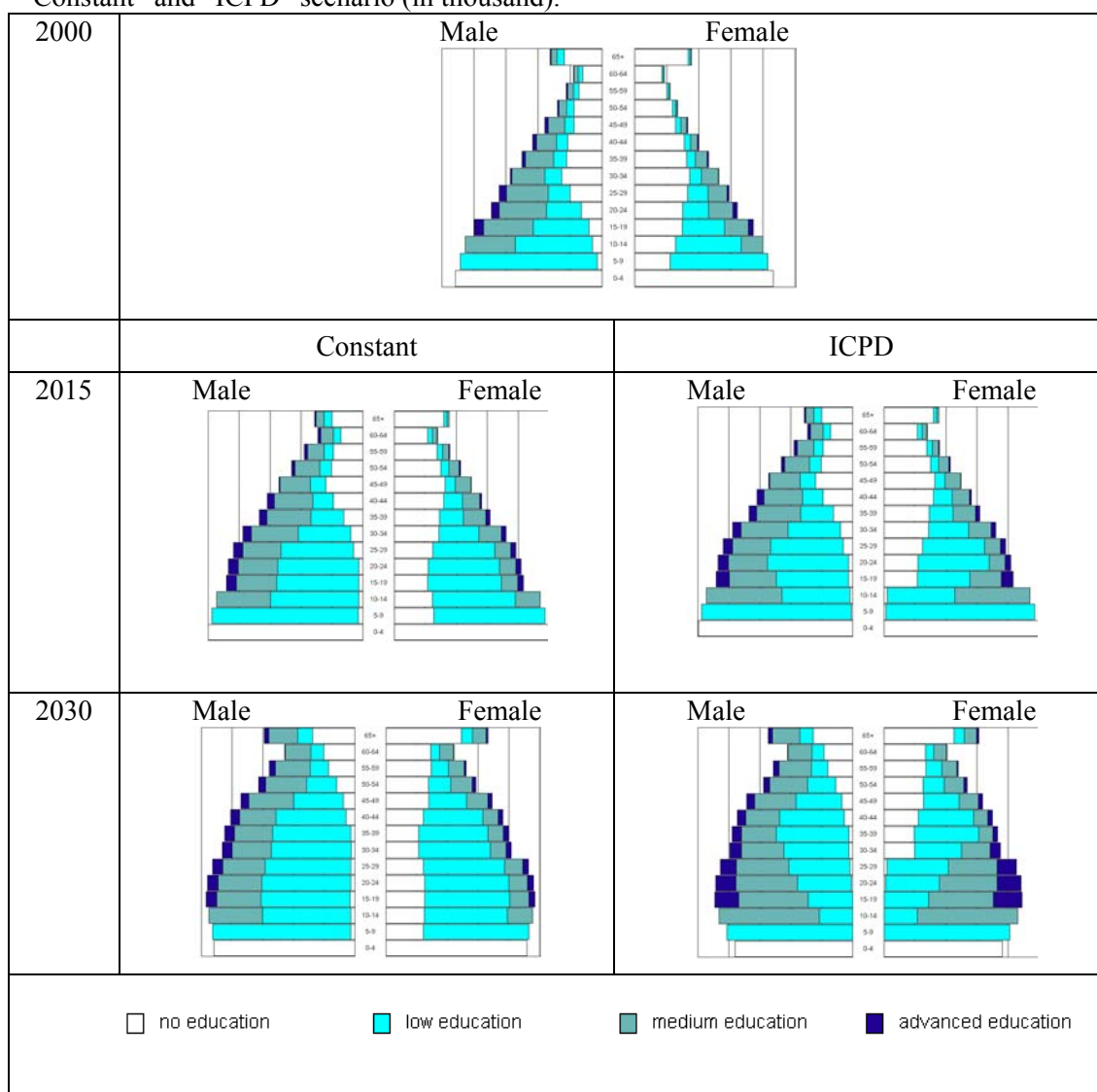
Two components were added to the “ICPD” scenario. All developing countries will achieve 75% participation in secondary education for boys and girls by 2025–2030. The rates of enrollment in tertiary education will increase by 5% by projection period in all regions, except in the North American region, where transitions are already above 50% for both sexes.

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 similar source as 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 percent 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 percent 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 percent.

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 “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 labor force will not be affected by 2030, and even less by 2025. 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 percent 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. In a number of African countries, recent declines in school enrollment rates even imply a deterioration of the educational composition in the longer term.

Figure 2. Age and education pyramids for South Asia in 2000, 2015 and 2030 according to “Constant” and “ICPD” scenario (in thousand).



Source: Author's calculation.

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 noticing that in 2015, the educational composition of the population does not differ significantly between the ICPD and the constant scenario, pointing again to the slow translation of the improvements in school enrolment into educational attainment of the work force. Under the “ICPD” scenario, which puts emphasis on rapid steps toward universal primary education, 7% of the world male population above age 15 and 14% of the world 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. 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 they 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.

Table 1. Share of the working-age population aged 20–65 by level of educational attainment according to two scenarios in MDR and 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	Male	1.5	23.0	0.8	13.5	0.8	13.5	0.7	8.2	0.7	7.5
	Female	2.3	39.2	1.2	26.8	1.2	26.8	0.8	20.0	0.8	16.2
Primary	Male	16.5	32.1	10.5	34.7	10.5	35.0	7.8	37.4	7.3	34.6
	Female	19.0	30.9	11.4	34.6	11.4	34.9	7.8	36.6	7.3	34.3
Secondary	Male	54.8	38.3	58.1	44.7	58.0	44.4	59.3	46.7	58.6	48.9
	Female	53.7	25.8	56.5	33.7	56.4	33.4	57.0	37.8	56.2	42.0
Tertiary	Male	27.2	6.6	30.6	7.1	30.7	7.2	32.2	7.6	33.4	9.0
	Female	25.0	4.1	30.9	4.9	31.1	5.0	34.4	5.6	35.7	7.5

Source: Author’s calculation.

In the same way that MDR will have a lower share of the world population in the future than LDR, the human capital of the planet will be concentrated in LDR. Whereas 77% of the working-age population (age group 20–65) lived in LDR 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 (Table1). The constant scenario shows what the educational structure would be if all future cohorts adopted the enrollment rates of today. In that case, two major changes would occur in the educational composition of LDR: (i) a decline of illiteracy from one-third of LDR’s working-age population 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 MDR, 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.

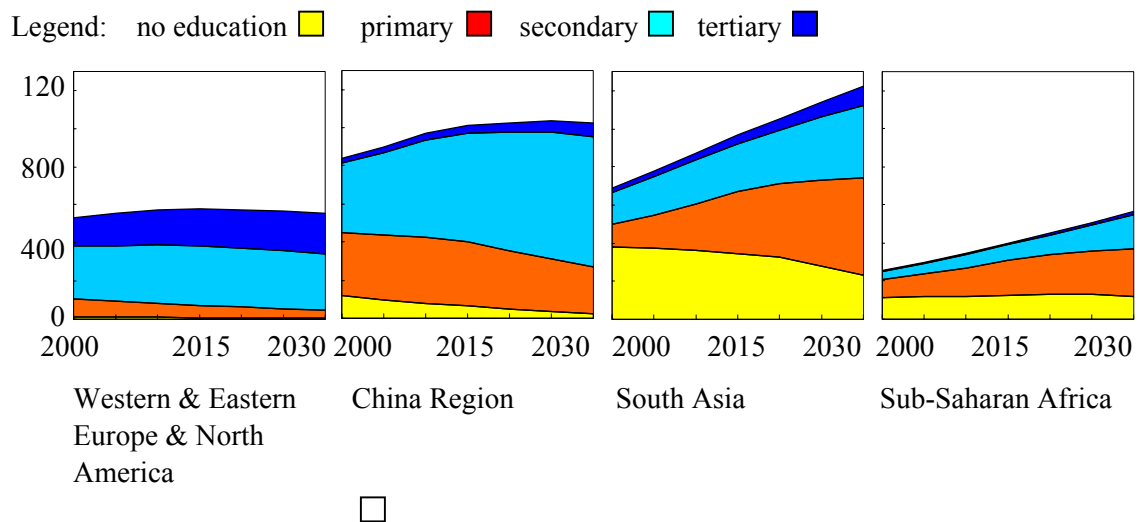
The changing educational composition of the population is significant not only for individual development and a nation’s institutional and economic performance, but also for the relative weights, productivity, and competitiveness of major world markets. In this context it is useful to look at absolute 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 20–65) by educational attainment. The data presented is taken from the “ICPD” scenario. This scenario reflects the quantitative objectives concerning education of 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, 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 most numerous 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 of 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-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.

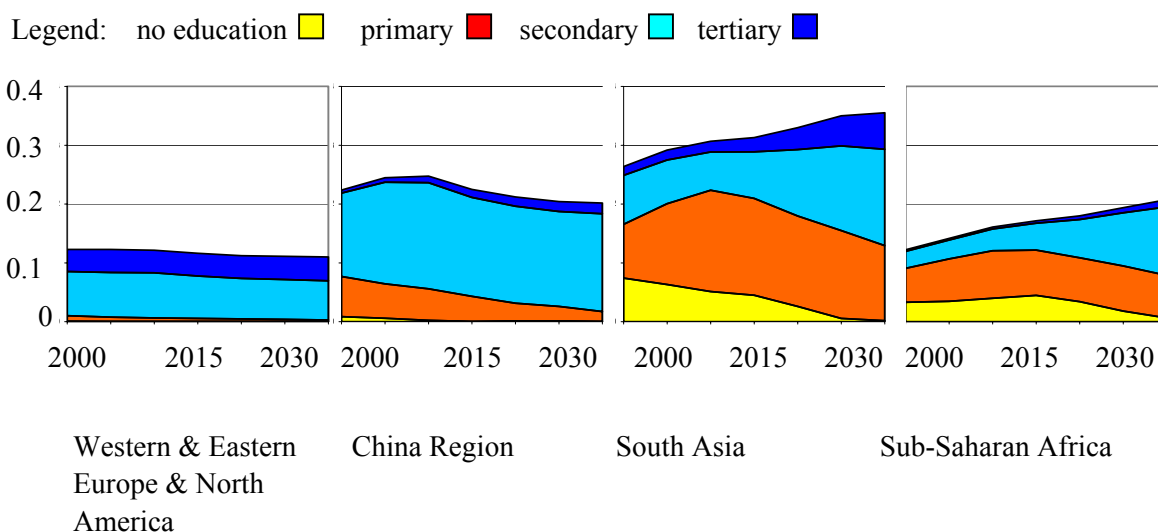
In Sub-Saharan Africa, low human capital associated with enormous pressure on the educational system poses significant limits to the prospects for social and economic development in the nearer term. In 2000, only 19% of the population in the 20–65 age group had a secondary education or higher. In 2015, this percentage will only have slightly increased to 21 percent. 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,

Figure 3. Population aged 20–65 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.

These results also indicate that financial investments in the education system will need to be raised substantially to cover the increase in enrollment rates and the increase in population size in developing countries. Population growth 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 scenario. Figure 5 illustrates the same for a few regions. It shows that even if all regions keep the levels of enrollment at the present rate, the number of pupils to enter an institution for 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 education system, as almost 50 million students more will enter 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 2000-05. 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 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 enrollment ratios, ever-larger proportions of central government expenditures will have to be allocated to financing education. On the contrary, Table 2 shows that MDR will face a decline of the absolute numbers of students entering higher education as a result of the decrease in the reversal of population growth.

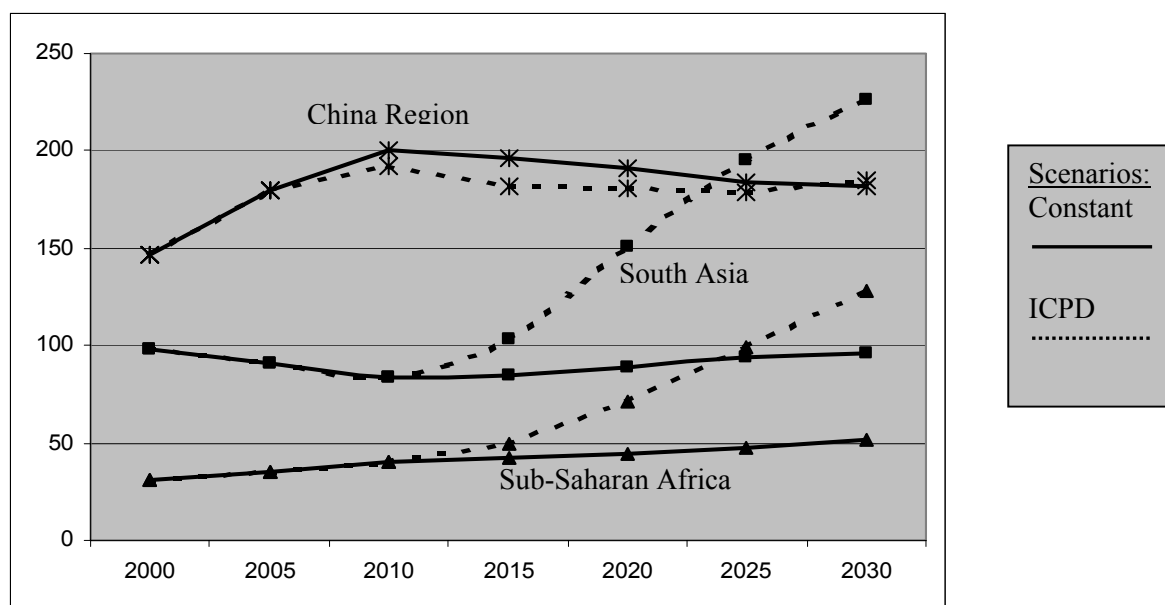
Table 2. Population in the 15–24 age group with secondary or tertiary education, according to "constant" and "ICPD" scenario, in 2000, 2015, and 2030.

Regions	Constant scenario			ICPD scenario	
	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 in the 15–24 age group (in millions) with secondary or tertiary education, according to "constant" and "ICPD" scenario in three regions, 2000–2030.

Source: Author's calculation.



Conclusions

Our projections and pyramids convey a mixed message. Although they depict considerable educational progress between 2001 and 2026-2030 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 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.

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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 education		Primary		Secondary		Tertiary		No education		Primary		Secondary		Tertiary		No education		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

Appendix Table 1 (Continued)

	2030 – Scenario Constant								2030 – Scenario ICPD								
	No education		Primary		Secondary		Tertiary		No education		Primary		Secondary		Tertiary		
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
Regions:																	
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	