academicJournals

Vol. 7(26), pp. 2592-2596, 14 July, 2013
DOI: 10.5897/AJBM12.655
ISSN 1996-0816 © 2013 Academic Journals
http://www.academicjournals.org/AJBM

African Journal of Business Management

Full Length Research Paper

Demographic dividend and literate life expectancy: The case of Pakistan

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Accepted 12 July, 2013

During the demographic transition from high mortality and fertility to low mortality and fertility, the age structure of a country changes, so that for a period the proportion of the population (which is of working ages) rises and then falls. This period during which the working-age population is relatively large is often termed the 'demographic dividend', a phenomenon which may be exploited by a country to accelerate economic development. The effectiveness with which a country may make use of the demographic dividend in this way, however, depends on the level of human capital of the working population, which determines its productivity. One way of measuring human capital is to use the so-called literate life expectancy, which is an estimate of the average number of years a member of the population spends in the literate state. This paper describes the calculation of the literate life expectancy for Pakistan, and compares the situation of Pakistan with that of other countries.

Key words: Demographic transition, demographic dividend, human capital, life table, literate life expectancy.

INTRODUCTION

During the demographic transition from high mortality and fertility to low mortality and fertility, the age structure of a country changes, so that the proportion of the population (which is of working ages) rises and then falls. This temporary expansion of the working-age population relative to the dependent young and old has been termed the 'demographic dividend' (Bloom et al., 2003). It has been suggested that the demographic dividend provides a window of opportunity for a country to accelerate its economic growth, as the average productivity of the members of the population will be increased by the relative shortage of unproductive dependent old and young persons (Bloom and Canning, 1999; Bloom et al., 2007).

The size of the demographic dividend is determined by the ratio of the working age to the total population, and this in turn is a function of the magnitude of the decline in fertility and mortality, and the rapidity and relative timing of the declines in mortality and fertility. In many African and Asian countries, where fertility and mortality rates before the demographic transition were high, and the decline of mortality rapid, the potential demographic dividend is large.

The increased labour supply during the years of the demographic dividend has the potential to accelerate a country's economic growth. It is important for a country to make the maximum use of this period, as the beneficial effect of the favourable age distribution is transient; and eventually the large cohort of working age people will become elderly and tend to hold back economic growth (Bloom and Williamson, 1998). The potential benefit which a country can accrue during the years of the 'demographic dividend' depends upon several factors, including the maintenance of health improvements, and

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the ability of the economy to create employment for the large cohort of workers. Crucially, it also depends on the level of education of the population for, as Bloom and his colleagues have stated: 'the baby-boom generation will not reach its full potential if its members do not receive adequate education. They will not be able to contribute to the economy if there are no jobs for them to do (or if they are not qualified to do them)' (Bloom et al., 2001). Similarly, even if a population is relatively well educated, heavy mortality among young adults can reduce the potential demographic dividend, as is the case in Southern African countries in which HIV/AIDS is highly prevalent.

In this paper we illustrate and attempt to measure the potential impact of the demographic dividend in Pakistan using a measure which combines education and mortality, specifically the *literate life expectancy*. Pakistan is an interesting case study for empirical work in connection with the demographic dividend. It ranks sixth among the most populous countries of the world (184.8 million in 2010), and is projected to rank fourth by 2050 (Population Reference Bureau, 2010). Its fertility was high before the demographic transition and its mortality decline was rapid, so its potential demographic dividend is large.

Literate life expectancy

The value of the demographic dividend, as we have said, increases with the level of human capital of the 'extra' workers. The measurement of human capital has a long history since the 1960s, but many measures focus on the level of education in a population, on the basis that a better educated population is likely to be more productive than a population whose members generally have little or no education. But the productive value of each person also depends on how long he or she can expect to live. To measure both these components simultaneously, Lutz (1995) developed an indicator called literate life expectancy (LLE). The LLE measures the average number of years a person (whether man or woman) lives in the literate state by combining the social development aspect of life expectancy and literacy into one number. The LLE approach has been used in some countries to measure social development in Mexico, China, India, and Bangladesh (Chattopadhyay and Sinha, 2010; Khan and Asaduzzaman, 2007; Huang and Nanjo, 1998, Medina 1996).

SOURCES AND METHODS

To estimate the time span over which Pakistan's demographic dividend will be evident, the main data source used was the database contained in Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2008). This database provides past and current estimates of 21 demographic indicators in each country of the world together with their likely future values under four variant assumptions about future fertility rates. In this paper we use the medium variant and consider the period 1950-2050.

The estimation of LLE is based on the ordinary life table method (Namboodiri and Suchindra, 1987; Hinde 1998). This involves using age-specific mortality rates to estimate the number of person-years of life that would be lived in each age group by a certain number of births. These person-years are then multiplied by the proportions literate in each age group to provide an estimate of the expected number of person-years to be lived in the literate state in each age group by the given number of births. The LLE at age *x* years can then be calculated by summing these 'literate person-years' over all age groups from *x* to the oldest age and dividing by the number of survivors to age *x* from the original number of births.

The data requirements are therefore age-specific mortality rates and the proportions of literate in each age group. We obtained age-specific mortality rates from the Pakistan Demographic Survey (PDS) (1999) and the age-specific proportions of literate from the report of the 1998 population census of Pakistan (Population Census Organization, 2001; Government of Pakistan, 1999).

We shall be interested in contrasting the LLEs of rural and urban areas. No separate information was available on mortality rates for rural and urban areas from the PDS report, but information on the age-specific proportions of literate were readily available for rural and urban regions from the population census of 1998. In this paper, we restrict attention to literate life expectancy at 10 years and over, as literacy below the age of 10 years is very low.

We therefore assumed that there is no difference in regional age-specific mortality rates after age 10 in Pakistan. Although there undoubtedly exists substantial difference in regional male and female mortality rates below that age, these will not affect the calculations in this paper.

RESULTS

Theoretically, the demographic dividend is measured by the difference between the rate of growth of the working age population and the total population. Positive differences offer a one-time window of opportunity for any country or region to make use for economic growth. Figure 1 shows the differences in Pakistan at five-year intervals from 1960 until 2050 (using the projected population structure for the years from 2010 onwards). The first year for which the working age population grows faster than the overall population is 1985. The demographic dividend then lasts until 2050, being most substantial in the first decade of the 21st century, but remaining large until 2030. Pakistan, therefore, is set to benefit from a 65-year window of economic opportunity created by its demographic transition, which confirms the observation of Durr-e-Nayab (2008). It is currently just under half way through that period.

Table 1 presents calculations of the literate life expectancy (LLE) for Pakistan based on the most recent available mortality rates and proportions of literate. The conventional life table columns are given as well as the proportions of literate, the literate life expectancy at each age from 10 years to 65 years. Results are presented for the total population and for males and females separately. The overall life expectancy at 10 years of age is 53 years for males and 54 years for females. However, the LLE is just 27 years for males and 14 years for females,

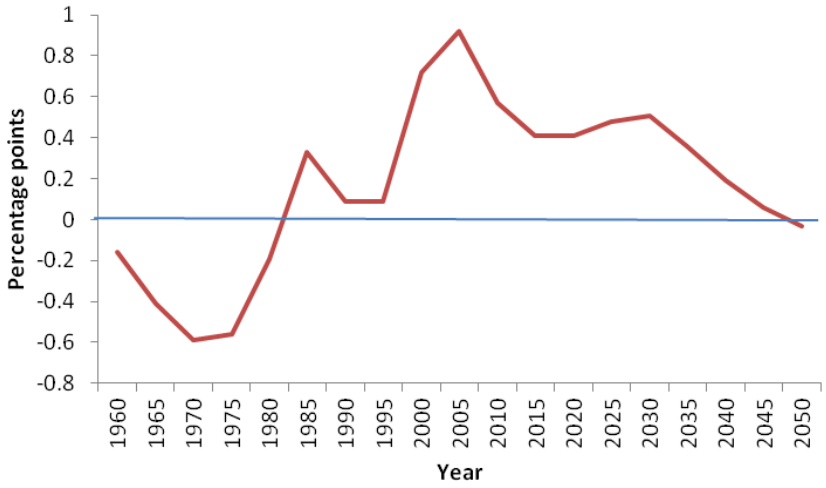

Figure 1. Difference between annual rates of growth of working age population and total population, Pakistan (1960-2050). Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2008).

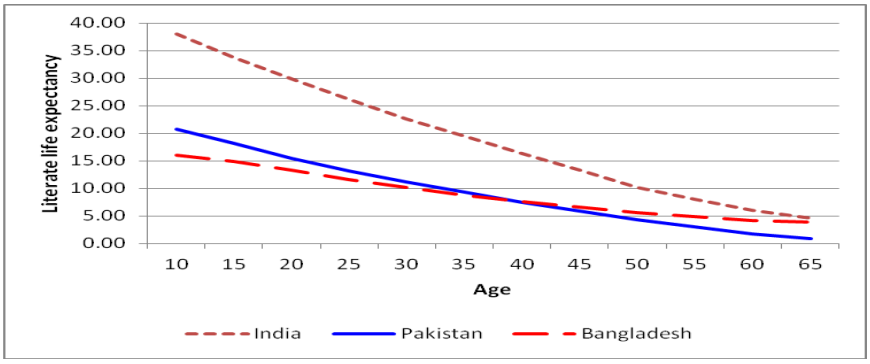

Figure 2. Literate life expectancy of populations of Bangladesh, India and Pakistan. Sources. India, Chattopadhyay and Sinha (2010), Pakistan, Bangladesh, Khan and Asaduzzaman (2007).

respectively, showing that, accounting for mortality, only half of Pakistani men and just over a quarter of Pakistani women are literate. Almost all of these literate years will be spent in the working age groups, however, the LLE for males aged 65 years is just over 1 year, and that for females aged 65 years is under 1 year.

DISCUSSION

It is interesting to compare Pakistan's LLE with those of other neighbouring countries. In the case of Bangladesh, the LLE for males (age 10) was estimated at 23 years for males and 9 years for females (Khan and Asaduzzaman, 2007). Thus, Pakistan's LLE is higher as compared to Bangladesh at 10 years; however the LLE of Pakistan does become smaller than Bangladesh at ages above 45. For urban dwellers, the LLE for Bangladesh is 34 years for males and 16 years for females; and for the rural population it is 20 years for males and 8 years for females (Khan and Asaduzzaman, 2007). The comparison with Bangladesh can be extended by considering the residential (urban-rural) and sex differentials with in residential levels. It is argued that the comparison in this way perhaps more efficiently demonstrates Lutz's idea of social development. According to figures provided in Table 2, Pakistani urban males have 35.5 years of LLE at age 10 while rural males had 22.2 years. The urban-rural differential in the LLE at age 10 is 13.3 years which is similar to that of Bangladesh (13.5 years). In the case of females, urban females live roughly three times longer (25.1 years) in the literate state than do rural females (8.1 years). For urban women there is a contrast between Pakistan and Bangladesh: a Pakistani urban female can expect to live almost 10 more years in the literate state compared to an urban Bangladeshi women. In case of rural females, however, the difference between the LLEs of Pakistani and Bangladeshi women is small.

Figure 2 compares the situation in Pakistan and

Table 1. Calculation of literate life expectancy for total population, males and females in Pakistan.

Age (x)	n	$_nm_x$	$_nq_x$	l_x	$_nL_x$	T_x	e_x	Pl_x	$_nLL_x$	Le_x
Total population										
10	5	0.0025	0.0124	848	4.221	2.309	45.282	53	0.5470	20.69
15	5	0.0019	0.0095	837	4.173	2.378	41.061	49	0.5698	18.20
20	5	0.0034	0.0169	829	4.120	2.078	36.888	44	0.5044	15.50
25	5	0.0030	0.0149	815	4.057	1.784	32.768	40	0.4398	13.22
30	5	0.0037	0.0183	803	3.990	1.640	28.711	36	0.4110	11.20
35	5	0.0037	0.0183	788	3.918	1.577	24.721	31	0.4026	9.33
40	5	0.0052	0.0257	774	3.834	1.388	20.803	27	0.362	7.46
45	5	0.0038	0.0188	754	3.749	1.211	16.969	23	0.3229	5.82
50	5	0.0	0.0430	740	3.639	1.039	13.220	18	0.2855	4.29
55	5	0.0094	946	0.0459	708	3.486	9.581	14	0.2713	3.02
60	5	0.0177	691	0.0847	676	3.272	6.096	9	0.2113	1.76
65		0.0513	1.0000	618	2.824	2.824	5	0.1773	501	0.81
Male										
10	5	0.0026	0.0129	834	4.152	44.463	53	0.6087	2.527	26.90
15	5	0.0019	0.0095	823	4.104	40.312	49	0.6698	2.749	24.18
20	5	0.0029	0.0144	815	4.055	36.302	44	0.6374	2.585	21.04
25	5	0.0034	0.0169	804	3.994	32.153	40	0.5706	2.279	18.13
30	5	0.0035	0.0173	790	3.927	28.158	36	0.5342	2.098	15.56
35	5	0.0036	0.0178	776	3.858	24.231	31	0.5095	2.057	13.13
40	5	0.0058	0.0286	762	3.773	20.373	27	0.5095	1.922	10.67
45	5	0.0047	0.0232	741	3.677	16.600	22	0.4654	1.711	8.39
50	5	0.0091	0.0445	723	3.557	12.923	18	0.4124	1.467	6.23
55	5	0.0102	0.0497	691	3.398	9.366	14	0.3963	1.347	4.39
60	5	0.0152	0.0732	657	3.199	5.968	9	0.3075	984	2.57
65		0.0530	1.0000	609	2.769	2.769	5	0.2556	708	1.16
Female										
10	5	0.0025	0.0124	861	4.289	46.110	54	0.4766	2.044	13.86
15	5	0.0019	0.0095	851	4.240	41.821	49	0.4633	1.965	11.63
20	5	0.0039	0.0193	842	4.182	37.581	45	0.3704	5.549	9.41
25	5	0.0026	0.0129	826	4.116	33.399	40	0.3024	1.245	7.72
30	5	0.0038	0.0188	816	4.050	29.283	36	0.2741	1.110	6.30
35	5	0.0037	0.0183	800	3.977	25.233	32	0.2568	1.021	5.03
40	5	0.0046	0.0227	786	3.897	21.256	27	0.2085	812	3.83
45	5	0.0027	0.0232	768	3.824	17.360	23	0.1702	651	2.86
50	5	0.0085	0.0134	757	3.725	13.535	18	0.1421	529	2.04
55	5	0.0085	0.0416	726	3.580	9.810	14	0.1234	442	1.40
60	5	0.0207	0.0416	696	3.348	6.230	9	0.0995	333	0.82
65		0.0488	1.0000	627	2.882	2.882	5	0.0827	239	0.38

Notes. The quantities in this table are defined as follows: $_nm_x$ is the age specific death rate between exact ages x and $x+n$ years; $_nq_x$ is the proportion of those alive at exact age x dying in the interval x to x+n years; l_x is the number of persons who attain exact age x out of 1,000 persons born; $_nL_x$ is the number of person years lived between exact ages x and $x+n$ years by the original 1,000 persons born; T_x is the total number of person years lived by the group from age x until all of them die; e_x is the average length of life remaining to persons who attain the exact age x; Pl_x is the age specific proportion literate; $_nLL_x$ is the literate person-years lived between exact ages x and $x+n$ years by the original 1,000 persons born; and Le_x is the literate life expectancy at exact age x years. Sources: Pakistan Demographic Survey 1999, Population Census Organization (2001), Government of Pakistan (1999).

Bangladesh with that in India. The contrast is striking. The LLE at age 10 in India is 38 years, and remains close to double that of both Pakistan and Bangladesh throughout the working age range. This suggests that there is a great deal of room for improvement in the human capital of both Pakistan and Bangladesh which would allow these countries more effectively to exploit their demographic dividend. There is still time for Pakistan to raise literacy in order to tap into the advantages conferred by its demographic development, but the matter is becoming urgent. As we have seen, Pakistan is almost half way through the 60- to 65-year period during which the demographic dividend will be effective.

Since the country's ability to take advantage of the demographic dividend is a function of the human capital of its workers, an implication of our results is that attention should be focused on females and rural areas.

The male LLE at age 10 in urban areas, at more than 35 years (Table 2), is close to that of India (Figure 2) and more than 10 years higher than that of females in urban areas. In rural areas, LLE at age 10 is 22 years for males and 8 years for females, respectively, 13 and 14 years less than the corresponding figures for urban areas.

According to the report of the 1998 Census of Pakistan, two thirds of the population live in rural areas (67.5%) (Population Census Organization, 2001). However, the population is rapidly urbanising, and according to a recent report by United Nations, the urban population is likely to equal the rural population by 2030. To the extent that it is easier to provide education to urban residents than rural dwellers, and because those who move to cities are more likely to seek educational opportunities, it is likely that this will lead to a rise in the overall LLE in the population. This should not, however, lead to any reduction in efforts to raise literacy in rural areas, especially among rural women, the subgroup of the population whose human capital is least well developed. If this can be achieved, there are still almost 40 more years of the demographic dividend's window of opportunity left for the more active human capital to promote rapid economic growth.

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