Educational Change and its Impact on Fertility and Demographic Dividend of Future India

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**Introduction:** A window of opportunity opens up towards the development of a nation as a consequence of rapid demographic transition. In developing societies mortality rates decline followed by a fall in fertility rates, inducing a change in the age structure. As a result of declining population growth there is a bulge in working-age population and shrinking dependent population that can allow for faster rates of economic growth when combined with effective policies and markets.

During the course of demographic dividend there are four pathways through which development can take place. First is the increased supply of labour. Secondly, decline in dependent population, puts a positive impact on national savings rate. An increased national savings rate in the capital scarce developing countries would essentially accumulate capital towards funding for the development causes. The third mechanism is through a developed human resource. A reasonably declined fertility rate means healthy and productive women. Fewer numbers of child birth will also reduce the economic burden from the family creating opportunities for the parents to invest more into the quality health and education per child, thus ensuring a more potential human capital. The fourth and lastly, growth will be ensured with the increasing domestic demand because of the rising GDP per capita and shrinking dependency ratio. Thus the main thrust should be towards the supply of an efficient working age population through better education and health system.

The effect of changes in the age structure of a nation upon its economy has been studied for decades (Coale and Hoover, 1958; Easterline, 1967; Simon, 1981; Ehlrich and Ehlrich, 1990, Bloom, Canning and Malaney, 2000; Mason, 2005). The underlying theory says that demographic dividend puts a positive impact upon a nation’s economic development, and that in high fertility societies, fertility reduction is a potentially powerful tool to reduce poverty (Eastwood and Lipton, 1999; Mason and Lee, 2004; Li and Zhou, 2007). However, at the same
time fertility reduction in a developing country poses a couple of serious challenges to the policy makers. As the number of working-age people increases the first challenge would be to endow these young people with proper training to form an efficient human resource and secondly to provide them gainful employment, in order to optimize on the economic opportunities. As Nayab (2007) mentioned in his study on Pakistan that capitalizing on the demographic dividend needs thoughtful and prompt action and he emphasized mainly on the education and training besides encouraging savings for a successful social security system.

Evidences from East Asian countries suggest that changes in age structure has resulted in an overwhelming economic success in last couple of decades (Bloom et al. 2000; Riley, 2004) and even the Sub-Saharan African countries have potential to reap the sizeable amount of demographic dividend assuming a policy and institutional context that is conducive to economic growth (Bloom et al., 2007). Amongst many South and South-East Asian countries, Bangladesh enjoying great success with family planning programs, India with impetus on basic and secondary education and technology sector, Thailand’s drive for better health, turned out highly thriving in liberalizing their markets and attracting foreign investments (Bloom, Canning and Sevilla, 2003).

India is the second highest populated country in the world, contributing to 17 percent of the world population. The country presently is experiencing the third stage of demographic transition. Following a fall in mortality rates, fertility rate has been declining for last few decades. India’s demographic indicators have shown signs of significant improvement from 1951 till 2010. As per Sample Registration System of India (SRS, 2011), the Crude Death Rate has declined from 25 in 1951 to 7.2 in 2010, while Crude Birth Rate has fallen from 40.8 to 22.1 during the period. India has also experienced a sharp fall in Infant Mortality Rate (IMR) from 146 per 1000 live births in 1951 to 47 in 2010. Total fertility rate (TFR) declined from 6.0 to 2.5 during these six decades. According to the National Population Policy (NPP, 2000), India had targeted to achieve the below replacement level fertility by 2010; but they failed to attain that level. Total Dependency Ratio in India was highest in 1970 while there were almost 120 people aged 0-14 years and more than 65 years per 100 people aged between 15-64 years of age. However the ratio declines consistently to touch 83 points mark. United Nations predict that this dependency ratio will continue falling till 2040s.
NPP also suggests that school education should be free and compulsory up to age 14 and to reduce drop outs at primary and secondary school levels to below 20 percent for both boys and girls. Though there has been considerable progress in attainment and participation in tertiary education in India during 1983 to 2005, they remain low. Still there are huge gaps between socio-economic classes in terms of enrolment and transition from secondary to tertiary education (Azam and Blom, 2008). According to World Bank data there has been significant improvement in attaining school education in India over the past two decades, but still gender parity has not yet achieved.

This ongoing demographic transition has resulted into an increase in proportion of the working age people in its population. Debates are floating around the emergence of this demographic dividend in India in recent times (Kelkar, 2004; Mason, 2005; Chandrasekhar et. al. 2006; James, 2008). There are ambiguities regarding the potential impacts of this working age population on economic growth, which has largely been unexplored. Several researches conclude that there is a strong positive correlation between demographic dividend and the state’s economic performance, and India has already started gaining from the changes in age structure (Aiyar and Mody, 2011). But there are concerns that the fruits can be enjoyed only when the incentives are in places especially in education, health and employment fronts (Chandrasekhar et. al. 2006; James, 2008).

Even though the overall fertility rate has declined significantly over the years, currently it is still very high among the less educated and lower socio-economic stratum people in India. Hence, it is most likely that there will be a high representation of these under-privileged people within the young working age population of India in near future. Given the heterogeneity in India, it would be essential gain an idea about the features and future demographic dividend across states and sub-populations of this country. However, in this study we are confining ourselves in analyzing the Indian scenario as a whole in order to explore the relationship between education and demographic profile of the country and to explore the potential of the working-age population to realize the economic boom. Education may act as a proxy of socio-economic status of the population, as it is one of the major determinants of the socio-economic condition of an individual or household.

**Objective:** The main objective of this study is to project the educational attainment of the age-sex composition of India’s population given two different scenarios regarding education
developments during 2001-51, and thus to explore the potential of the demographic dividend together with education to enhance economic growth.

The two scenarios are: (1) Proportion of population across education groups in India remains constant over the years, as of it was in the year of 2006 (stagnant-edu) and (2) the proportion of Indian population attaining higher educational status increases over time (edu-transition).

**Data:** The data for the proposed study has been drawn from various sources. The projection is based on the data on population by age and sex from the census of India (2001). The information about the education wise age specific fertility rate was taken from the Sample Registration System of India, for the period of 2000 to 2010 (SRS, MoSPI, GoI). Regarding age and education specific survival rates and age-wise proportions of educational attainment data for Indian population, we have utilized the estimates from the projections carried out by Wittgenstein Centre for Demography and Global Human Capital (Source: forthcoming book Lutz, Blutz and K.C., 2013) following the assumptions adopted by them. Unfortunately migration could not be considered under this project, since data on education-specific migration rate for Indian population was not available.

**Methodology:** In order to attain the objective we have followed the framework adopted by IIASA to project the population by levels of educational attainment for all countries across the globe. A multi-state population projection technique, as described in Lutz and Goujon (2001), was followed. The ‘states’ here are seven categories of educational attainments across sex and age of the population. These categories are namely, illiterate, below primary (could not complete primary education), primary (till Std. IV), middle (Std. V-VIII), secondary (Std. IX-X), higher secondary (Std. XI-XII) and graduates and above. This study attempts to demonstrate the effect of education through a scenario based analysis, as mentioned in the objective section. The two scenarios are drawn based on the level of education. These assumptions are stated in brief through Table-1. Considering the first scenario, level of educational attainment across age groups in 2006 is going to remain same till 2051 that is there will be 29 percent of 20-24 years aged people as illiterates and seven percent of them are graduates during this period. Whereas if there is a gradual improvement in educational attainment then there will be only five percent illiterates
among 20-24 years aged population and the proportion of graduates will increase to 30 percent among this population after 45 years. Though we have projected the population within the age group of 0-15 years for the period of 2001-2051, for education-specific population projection our analysis has considered only the population aged 15 years and above.

Table-1: Assumption on education transition: Percentage of female population across levels of educational attainment during 2006 and 2051

<table>
<thead>
<tr>
<th>Year</th>
<th>Age</th>
<th>Illiterate</th>
<th>Below Primary</th>
<th>Primary</th>
<th>Middle</th>
<th>Secondary</th>
<th>High Secondary</th>
<th>Graduate and above</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>15-19</td>
<td>0.28</td>
<td>0.12</td>
<td>0.18</td>
<td>0.15</td>
<td>0.18</td>
<td>0.09</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>20-24</td>
<td>0.29</td>
<td>0.07</td>
<td>0.17</td>
<td>0.09</td>
<td>0.11</td>
<td>0.19</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>25-29</td>
<td>0.37</td>
<td>0.09</td>
<td>0.13</td>
<td>0.05</td>
<td>0.07</td>
<td>0.20</td>
<td>0.08</td>
</tr>
<tr>
<td></td>
<td>30-34</td>
<td>0.44</td>
<td>0.11</td>
<td>0.11</td>
<td>0.06</td>
<td>0.07</td>
<td>0.15</td>
<td>0.07</td>
</tr>
<tr>
<td>2051</td>
<td>15-19</td>
<td>0.04</td>
<td>0.03</td>
<td>0.16</td>
<td>0.22</td>
<td>0.33</td>
<td>0.23</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>20-24</td>
<td>0.05</td>
<td>0.02</td>
<td>0.10</td>
<td>0.06</td>
<td>0.09</td>
<td>0.38</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td>25-29</td>
<td>0.05</td>
<td>0.02</td>
<td>0.07</td>
<td>0.05</td>
<td>0.07</td>
<td>0.37</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td>30-34</td>
<td>0.07</td>
<td>0.02</td>
<td>0.08</td>
<td>0.04</td>
<td>0.06</td>
<td>0.34</td>
<td>0.40</td>
</tr>
</tbody>
</table>

Many studies have proved that education exerts strong negative effects on fertility, and especially female education (Cochrane, 1979; Jeffrey and Basu, 1996; Jejeebhoy, 1995). After analyzing the recent trend in education- and age-specific fertility rates among Indian women for the period during 2000 to 2010, we have assumed that they will follow the same trend in recent future. As demonstrated in figure-1, during last decade, except among illiterates and those who could not complete their primary (below primary level) education, there was stagnancy in the total fertility rates across all other educational categories. Hence, we presumed that the decline in fertility rates among illiterates and ‘below primary level’ educated women will continue at the current rate, till they converge with the fertility level among women with primary level education. Moreover, from figure-1 it is also evident that during 2000-2010 the decline in fertility in India had only been contributed by the illiterate and ‘below primary level’ educated women.
The potential of demographic dividend could be explained through the age-sex pyramids in different scenarios across seven educational categories. However, in order to understand the effect of educational attainment on the working age to total population ratio, and thus the prospect of the demographic dividend of India, we assigned weights on working-age population adjusted to levels of their educational attainment. This in turn may depict the productivity of the population. As shown in table-1, the weight distribution is applied considering that contribution to the economy by an individual increases at an increasing rate with the level of educational attainment.

**Table-2: Weight values attached according to the levels of educational attainment**

<table>
<thead>
<tr>
<th>Education Categories</th>
<th>Weight values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illiterate</td>
<td>1</td>
</tr>
<tr>
<td>Primary &amp; Below Primary</td>
<td>1.1</td>
</tr>
<tr>
<td>Middle (Standard VI-VIII)</td>
<td>1.2</td>
</tr>
<tr>
<td>Secondary (Std. IX-X)</td>
<td>1.35</td>
</tr>
<tr>
<td>Higher Secondary (Std. XI-XII)</td>
<td>1.5</td>
</tr>
<tr>
<td>Graduates &amp; above</td>
<td>1.75</td>
</tr>
</tbody>
</table>

**Results:**

Figure-2 portrays the projected trends in TFR across all the educational categories. Following our assumption of continuing the trend of TFR observed during 2000-2010, the figure shows that
the fertility levels among illiterates and ‘below primary level’ educated women will achieve the level of fertility for the women educated with ‘primary’ education that was assumed to be stable at 2.5. The parallel trend in fertility rates across education groups point up that the unlike the experience in most of the countries, in India fertility rates across educational groups will not converge in near future. Based on this finding we have built our scenarios. That is if the fertility level is not declining within a particular educational group, increasing education among population will be the strongest force to bring down the fertility.

**Figure- 2: Trends of projected TFR across all educational groups in India, during 2000-2051**

![Figure-2: Trends of projected TFR across all educational groups in India, during 2000-2051](attachment:image)

Figure-3 depicts the projected trend of TFR according to the two different scenarios assumed in the study. It is visible that if we consider that in India the current education profile among the people prevails for the period under this projection (stagnant-edu), then the overall TFR will reach to 2.26 during 2021 and will not fall further from the level achieved during 2020s, as TFR is not going to fall after 2021 among women from any educational group. However, if the proportion of population achieving higher education improves over the year (edu-transition) then the TFR declines constantly, though the rate will slow down after 2021. In this case, India will reach the ‘replacement level’ of fertility in 2041.
Figure-3: Projected trend of TFR of India during the period of 2001 to 2051 according to the two scenarios

Figure-4 portrays the age-sex distribution of Indian population aged 15 years and above across the level of educational attainment in the year of 2001. As mentioned before, we only consider the education distribution above age 15. In 2001 there was a considerably large size of infant, child and adolescent population in India. It is evident from the figure that higher the age group higher is the representation of the population with lowly educational attainment and as expected the proportion is higher among the females as compared to their male counterparts. It should be considered that during the age 15-19 years most of the current students are attaining secondary and higher secondary standards, with a minute fraction in middle and graduate level. Otherwise the education distribution across the age groups from the figure additionally depicts that the proportion of illiterates are declining with an increasing share of population at the higher education groups over the time.
The age-sex pyramid of Indian population across the levels of educational attainment has been presented here in figure-5, considering the first scenario where there is no educational transition during the period from 2006 to 2051. The population size will definitely increase in 2051 and the shape of the pyramid will also alter with a higher representation of population in the working age groups given the decline in mortality especially among during the early ages of life.

Figure-5: Age-sex pyramid of Indian population across the levels of educational attainment in 2051, when constant proportion of population across educational levels

On the other hand considering the educational transition taking place, figure-6 shows that the working age population swells further with much larger population representation at higher
educational categories. The effect of the improvement in educational status on fertility behavior is also evident through the change in age-sex composition. As compared to the figure-5, here we can see that the birth rate has come down with an improvement in the survival rate among the children aged 0 to 9 years old. The most important point to note here is that the impressive share of population in higher education groups, which in turn reflects the enhanced capability of the future human resource of India.

Figure-6: Age-sex pyramid of Indian population across the levels of educational attainment in 2051, with the increasing proportion of population across educational levels

![Age-sex pyramid of Indian population across educational levels](image)

Figure-7 depicts the productivity adjusted working-age to total population ratio. The varying productivity pattern across age groups says that not only there will be a shrink in the dependent population, but also quality of the support ratio (working age to total population) will improve portraying a more qualified and hence potential labour force to ensure the economic benefit for the country. Here the weights had been attached only to the numerator i.e. the volume of working population. The figure clearly depicts that if there is no weight attached to the population according to their educational attainment or productivity, then there is a slight improvement in the ratio of working population to total population within 2010 to 2030, even if there is an improvement in the educational profile among the Indian people; otherwise the benefit of economic potentiality is not reflected clearly. Again if the weights are attached to the population according to the educational attainment, then the enhanced capability of the working population having higher education is reflected through the increasing trend line, with a considerable
difference against the scenario in which India does not experience any educational improvement. This suggests that not only the improvement in educational profile of Indian population is essential to capture the benefits of demographic dividend, but its not sufficient until and unless the state is able to provide them better economic opportunities, utilizing their caliber at the most efficient way.

**Figure-7: Effect of productivity adjusted weights to the working-age to total population ratio**

![Graph showing effect of productivity adjusted weights to the working-age to total population ratio.](image)

**Conclusion:**

Our scenario based assumptions does not hold up with the optimistic pictures portrayed in various studies regarding the demographic dividend and its positive impact on Indian economic scenario. The recent fertility trend across educational groups does not show any sign of convergence at a fertility rate lower than below replacement fertility level, in near future. This projection states that if the current fertility trend and education attainment scenario prevails, then India is not going to achieve ‘below replacement level’ fertility before 2041. If the fertility behavior is not going to decline soon across educational categories India needs to educate more and more of its population with higher education so that heir reproductive behavior gets amended accordingly. Because parents with high education would invest on their children’s education and health rather than opting for a large family resulting into a more efficient working-age population. The results presented in this paper support the finding of P.N.M. Bhat (2002) that the
fertility is rapidly declining among the illiterates and below primary level educated women, may be realizing the importance of education. Hence, besides a sluggish rate of fertility decline, the concern is that the decline will mainly be contributed by the women who are either illiterate or could not complete their primary education. The scenario may aggravate if after few years the lowly educated women also demonstrate stagnancy in fertility rates. However, the country will be experiencing a bulge in working-age population, as the mortality rates especially among infants and children are expected to continue falling down significantly. The result depicts that the magnitude and character of India’s demographic dividend will be highly dependent upon the level of education among Indian people and the education transition in the following years.

According to Mason’s projection, demographic change in India during 2005-2050 are to raise per capita GDP growth by 1.24 percent per year through a combined effect of first and second demographic dividend. Goujon and McNay (2003) projected that there will be considerable educational progress between 2001 and 2026 in Indian states. But they believe that neglect in education and gender equity will deter the growth process with larger number of lowly educated population.

Studies on India have demonstrated that better education can lead to higher productivity, lower fertility and better health status, not only at individual level but also from a macro level point of view (Dreze and Murthy, 2001; James, 2011). Our study lends support to the research concluding that labour productivity affects demographic dividend positively through improvement in educational structure (Cuaresma, Lutz and Sanderson, 2012). High Total Factor Productivity (TFP) can be channeled through advanced human capital per worker that is better education. TFP measures productivity of a job capturing aspects like technology used and efficiency along with hard-to-measure entities like tacit knowledge, organizational capabilities and trust. Though, Sanderson and Striessnig found that there should be a higher Total Factor Productivity gain with older age-structure, but the negative impact on economy in a higher youth dependent working population was not proved through their study (2009). India’s growth in TFP has been impressive after its economic liberalization, but its growth in deployment of capital per worker is lower as compared to three Asian giants, China, Korea and Indonesia (GoI, 2013). Demographic dimensions of education significantly foster economic growth (Cuaresma and Mishra, 2011) and also play a major role in improving the health condition of the people and
productivity (KC and Lentzer, 2010; Lutz and KC, 2011). A high level of education in a society also induces better governance which in turn transforms into its socio-economic development through advanced policy measures and practices. An improvement in institutional quality and reduction in corruption in South Asian countries may help them to capitalize considerably on many of their socio-economic aspects (Sanderson and Striessnig, 2009).

There is wide regional difference in India in terms of various socio-economic achievements, including demographic and education transition. Ill distribution of resources in rural and urban areas and across various social groups is a serious impediment to achieve an optimal economic growth. Nevertheless, evidences from post-1980s show that the changes in age structure led to economic growth in Southern and Western states of India. We can be optimistic that the upcoming demographic transition in the lagging North Indian states, will bring a holistic development soon (James, 2008; Aiyar and Mody, 2011) and the same may be evident in entire South Asia (Sanderson and Striessnig, 2009). Gender bias in Indian societies are strongly practiced and manifested in terms of mortality, sex ratio, education or employment (Das Gupta and Bhat, 1997; Mammen and Paxson, 2000; Bhalla and Kaur, 2011). Bloom and his colleagues suggested that decline in fertility improves the female labour force participation and thus increases the proportion of working age population in labour force (2009). On the contrary, in India studies have found that female labour force participation has shrunk in recent times (Bhalla and Kaur, 2011; Chowdhury, 2011), which may be justified by Boserup’s (1970) argument on U-shaped pattern of female labour force participation with the growth process of a nation. India is experiencing an economic boom in last decade through its flourishing information technology sector, via job creation, remittances and foreign direct investment (Bloom and Rosovsky, 2001). There is a rise in share of employment in both industries and services. However during post-liberalization period the share of value added in industrial sector has largely been stagnant, whereas service sector’s experience is better than countries like Korea and Indonesia (World Bank, 2012). On the other hand, though development towards youth education is a positive side, but the growth in non-agricultural sector is not encouraging in recent times (Chowdhury, 2011).

Nevertheless, education has a long momentum: it does not jump suddenly. India, in fact, is much below the required level of education and health status to ascertain its economic development through the age-structure transition. Hence India will be handicapped by past and present lack of
investments in education and health. Most importantly, the enrolment and drop-out rates are not very convincing in this country in recent times. An immediate and consistent increase in education levels is required, which coupled with rapid fertility declines could be beneficial for Indian economy. Policy makers need to emphasize on higher and technical education and its quality to channelize the demographic dividend in the right direction.

**Limitation of the study:**

India is a vast country with huge socio-economic and demographic heterogeneity across states and region (Goujon and McNay 2003; Kurian, 2007). The fertility trends or level of education vary significantly across the states, along with various other indicators which are directly or indirectly intertwined in shaping the country’s growth dimension. This study does not provide a detailed state-wise picture of effect of education on future fertility pattern and the demographic dividend. Secondly, as the standard of education could not be captured in this effort, it was difficult to understand the intellectual development of the population. Thirdly, we followed a crude measure to assess the potential of the human capital, which is not only provision of formal education, but also skills, cognitive enhancement and better health.

**Reference:**


