An Analysis on the Link between Education and First Demographic Dividend of Bangladesh

Abstract

The study attempts to examine the role of education in first demographic dividend of Bangladesh. It is a matter of debate whether this dividend comes from purely age structure factor or it is an education dividend. The paper found that within-education-group support ratios do not come along the order of educational attainment except the finding that post-secondary education group embodies the highest support ratio. The study used the NTA methodology (2013) and further it used Das Gupta (1993) method for decomposing the dividend into an education effect and age effect. One of the major result is that the dividend was age effect driven while education effect was negative for past decades of Bangladesh.

Keywords: First Demographic Dividend, Support Ratio, Das Gupta Decomposition, Education Effect, Age Effect

Author: Shahidul Islam, Research Associate, Bangladesh Institute of Development Studies (BIDS)

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1. Introduction

The demographic dividend, which is viewed as a window for boost in economic growth offered by the change in the age structure of a population, results from the increasing shares of working age population. This phenomenon is referred to as the "First Demographic Dividend" and the same window is assumed to be closed after few decades with an introduction of a "Second" dividend resulted from potential savings accumulation by the wage that earners, given any further counter-shock in age structure will not happen within the period between first and second dividend. The idea behind relating economic prosperity, measured by the growth of per capita real output, with the change in age structure is due to the opportunities offered by the fall in dependency ratio. That is if the ratio of population of the ages below 15 and above 64 years are comparatively lower than economically active population of the ages 15-64 years in a country, it will prosper more. These opportunities can be explained in this way: the country has fewer faces to feed than the number of "wage earners". The term "demographic transition" is a discourse of demography but has impacts on the economic sphere of a country. As a result, economists are interested to explain "whether and how this "gift" offered by demographic transition can be reaped. This regime of demographic dividend demands special attention and policy helps from the policy makers.

The increase in the proportion of youth bulge can have beneficial effects on an economy because of several considerations. Firstly, there will be, possibly, an increase in labor force participation rate, and if labor market has the desired flexibility- ceteris paribus- the number of employed workers will increase. This channel will speed up the economy on the road to economic growth. Secondly, the households will have, on average, less dependent members and will have the opportunity of asset reallocation. Household savings can be increased substantially. Thirdly, the country which experienced this "demographic gift" will have the opportunity of reallocation of its resources. The expenditures for economically dependent citizens will be reduced. There is a possibility of reducing the budget deficit or/and allocating this released resources/fund toward productive functions. And lastly, if the correct policies are taken and implemented accordingly to make an effective and efficient investment in youth bulge in order to convert them to human capital, the country's factor productivity will increase. It will have a further contribution to economic growth. Thus, efficient investment in the education sector in a country, with a youth bulge, should have a growth effect on the economy.

The concept of demographic dividend introduced a new dimension to the debate on the economic effect of population growth. There are three tenets on the debate- one tenet claims that population growth has a positive growth effect, another tenet is totally opposite to this claim and the other, named as population neutralist, takes a middle of the road position claiming that the population growth has no significant effect on the per capita output growth. Bloom and Williamson (1998) are among the pioneers of the debate on the relationship between age structure change and economic growth. The later debate deals with a portion of the population which can have a direct contribution to the production of an economy. Two broad distinct tenets are found on the later debate- one on the side of a direct relationship between the dependency ratio and economic growth and the other sees the relationship as an indirect one, through human capital, education or productivity. The second debate was inherently related to the first debate. As a part and a variant

of the old debate on the effect of population growth on the economy, Bloom and Freeman (1986) investigated the effects of rapid population growth on labor supply and employment via the lens of fertility rates and mortality rates. Coale et. al. (1958) studied the growth history and the story of convergence in relation to fertility rates and mortality rates: they found that population growth rate, in general, has a negative consequence on the achievements on economic growth. Countries with higher population growth rates are trapped in low-income equilibrium whereas the fertility decline led to higher economic growth, though with a larger population base. Later, Bloom and Williamson (1998) found a strong and significant effect of demographic transition both on the growth of per capita output and on the growth of favorable indicators of growth- savings and investment. They estimated 0.4 percentage point contribution to Asia's per capita output growth and 0.6 percentage point to East-Asia's output growth as purely demographic one.

The investigation took a new look. Becker and Lewis (1973), started counting the benefit of low fertility using a microeconomic household utility framework, showed a tradeoff between quality and quality of children taken by parents. He also argued that taking an additional child has a tradeoff with the income of the mother. Lee and Masson (2009) showed that low fertility leads to investment in human capital and hence to human capital accumulation; and human capital accumulation has a positive effect on growth. Cuaresma et. al. (2013) investigated whether the demographic dividend is an "Education Dividend" using a production function approach disentangling the productivity effect- which captures the effect of education- and translation effect- which captures the pure demographic effect using panel GMM estimation technique. Estimating demographic dividend using just a regression approach is questionable if the study cannot make the results robust. Renteria et. al. (2016) used a non-parametric approach and further modified ESR series with education data incorporating the income and consumption profiles over different age groups and levels of education; and decomposed the ESR into two effects- education effect and age effect- to show how much of the demographic dividend will achieved through educational attainment for two economies- Spain, a developed economy and Mexico, a developing economy.

Our study followed a similar methodology used by Renteria et. al. (2016) for Bangladesh case. We find that Bangladesh experienced negative education effect and positive age effect during the observed phase of demographic dividend. However, the future of first demographic dividend in Bangladesh lies in education since the age effect slows down and eventually becomes negative.

Background:

Bangladesh showed a dramatic success in its population control policy. The fertility rate has been fallen down from 6.9 in 1972 to 2.1 in 2016. Despite this immense success in population, the country showed a fragile capacity to manage its human resources. Age structure has an implied importance on the growth of an economy through a skilled labor force. The country is experiencing an increase in labor supply, the question is how much it is capable to accommodate and mainstream this labor force to labor market and how these policies might affect the demand for labor and factor productivity growth. Khondoker and Rahman (2017) projected that first demographic dividend will cease within the period 2030-2045; the timeline depends on different assumptions on fertility growth. Within this time, employment friendly policy measures should be taken, especially putting appropriate attention to a right policy variable of the education sector. Vocational education did

not evolve over time significantly. Employment to population ratio is stagnant at 60% over the period 2009-2016 and was lower compared to earlier periods. According to BBS Labor Force Survey (2013), unemployment rate among the labors with post-secondary education is 9% (this rate is even higher in LFS-2010) whereas it is about 2% among the labors with no formal education.

However, industrialization might have taken place because of the supply of cheap labor; it is cheap either because of its lower productivity or a larger supply in the market. The growth of Bangladesh is mainly driven by semi-educated and low skilled labor. Agriculture has a decreasing but significant role in GDP. Ready Made Garments (RMG) industry has a dominant role in the industrial production of the country. While RMG employs about 8.4% of total labor force, the skill gap is second highest in RMG (BIDS, 2017) and highest in agro-food production. World Bank (2013) argues that, given the recent pattern of economic growth (that is, competition on the basis of low cost, driven primarily by low-skill, low-wage labor-intensive employment, rather than higher productivity of the labor force), it is also possible that Bangladesh might get stuck in a low-wage, low productivity trap. The report additionally claims that though the country has thrived in providing grater educational entrée to its population, learning is low and unequal. Amid this story, we cannot assume that the country will achieve the benefit of demographic dividend at full length and education of the labor force did not help in productivity gain. The benefit of the growth of working age population on per capita output growth will be through age effect.

There two papers, dedicating demographic dividend in Bangladesh context, to mention: Chowdhury (2014) and Khondoker & Rahman (2017). Chowdhury (2014) analyzed the age structure of the population of Bangladesh and showed that the working age population is sharply rising. He prescribed some policies in order to grasp the economic benefit of this demographic change. Among existing literature on Bangladesh's demographic dividend, Khondoker & Rahman (2017) extensively and rigorously investigated the possible deadline of first demographic dividend and what could be the policies to get benefited from this demographic dividend. The previous works did not include education as an endogenous factor when it explained the demographic dividend and hence could not measure the effects of education on demographic dividend. The existing literatures are also unable to present evidence based conclusion whether Bangladesh's demographic dividend is dominated by age component. The contribution of this paper will be the decomposition of the effects of education and ages on demographic dividend treating education as an endogenous factor and more specifically evaluating the contribution of education sector on capturing the economic benefits of it.

1. Methodology

National Transfer Account (NTA) attempted to measure the trend of demographic dividend with support ratio (NTA, 2013). We will use Economic Support Ratio (ESR). ESR has been developed in following procedure.

Income per capita can be written as

$$\frac{Y(t)}{N(t)} = \frac{W(t)}{N(t)} * \frac{Y(t)}{W(t)} \qquad (1)$$

$$y(t) = w(t) * \hat{y}(t) \qquad (2)$$

Where Y is total income, N is total population size and W is size of working population. $w(t)$ is the share of working age population in the total population and also defined as the support ratio. $\hat{y}$ can be defined as output per labor if labor force participation rate is close to 1.

$$g(y) = \text{g(SR)} + \text{g}(\hat{y}) \qquad (3)$$

So, per capita income growth is equal to the sum of two growths- growth in support ratio and growth in output per labor. The growth of support ratio has been termed as "translation effect" and growth in income labor is due to "productivity effect." However, a modified version of the support ratio, ESR, is used in this paper. ESR captures per capita age profile of income and consumption and uses effective number of labor and effective number of consumer to calculate ratio instead of the total labor and population data. This replacement of labor and population data, by effective labor and effective consumer respectively, helps to incorporate relevant economic profiles to the analysis of a purely demographic context.

Series of effective labor and effective consumer are defined in National Transfer Account (NTA) as

$$\hat{L}(t) = \sum_i N_i(t) * l_i \qquad (4)$$

$$\hat{C}(t) = \sum_i N_i(t) * c_i \qquad (5)$$

The summation is over different age groups l_i and c_i are ratio of per capita age profiles of labor income and consumption to per capita age profiles of labor income and consumption of population aged between 30-49 years successively, measured at a fixed year. Renteria et. al. (2014) further modified the equation (4) and (5) with the information on levels of education.

$$\hat{L}(t) = \sum_j \widehat{L_j}(t) = \sum_i \sum_j N_{ij}\,(t) * l_{ij} \qquad (6)$$

$$\hat{C}(t) = \sum_j \widehat{C_j}(t) = \sum_i \sum_j N_{ij}\,(t) * c_{ij} \qquad (7)$$

ESR can be defined as the ratio of the effective labors to the effective consumers.

$$ESR(t) = \frac{\hat{L}(t)}{\hat{C}(t)} \qquad (8)$$

The second summation over index j is the summation over levels of education. We will use the ratio of equation (6) and (7) as ESR which contains the information of level of education of the population. After estimating ESR (with projections), the paper will proceed to decompose the change of ESR between two consecutive periods following Gupta's (1993) method. Gupta's method, which is a refined version of Kigtagawa (1995), is widely used in demography to find the effects of contributing factors on a rate- each factor's effect is estimated keeping other factors constant. This paper will use his method for decomposing ESR for cross-classified data (Chapter-5). The decomposition will estimate the effect of age and education for each period separately. The population composition captures the main parts of the effects.

$$\frac{N_{ij}(t)}{N(t)} = \underbrace{\left(\frac{N_{ij}(t)}{N_j(t)} * \frac{N_i(t)}{N(t)}\right)^{0.5}}_{= a_{ij}(t)} \underbrace{\left(\frac{N_{ij}(t)}{N_i(t)} * \frac{N_j(t)}{N(t)}\right)^{0.5}}_{= e_{ij}(t)} \quad (9)$$

a_{ij} and e_{ij} captures the variation in the composition of population due to age structure and years of education respectively over time.

$$\mathrm{A(t)} = \sum_i \sum_j \frac{esr_{ij}(t)+esr_{ij}(t-1)}{2} . \frac{e_{ij}(t)+e_{ij}(t-1)}{2} . a_{ij}(t) \quad (10)$$

$$\mathrm{E(t)} = \sum_i \sum_j \frac{esr_{ij}(t)+esr_{ij}(t-1)}{2} . \frac{a_{ij}(t)+a_{ij}(t-1)}{2} . e_{ij}(t) \quad (11)$$

A (t) corresponds to rate and age standardization of the age effect at time, $E(t)$ corresponds to rate and education standardization of the education effect and $esr(t)$ stands for the growth in ESR at period t.

Now, the effects are defined as following:

$$Age\ effect = A(t) - \mathrm{A(t\text{-}1)} \quad (12)$$

$$Education\ effect = E(t) - E(\mathrm{t\text{-}1}) \quad (13)$$

As change in ESR between two consecutive periods, t and (t+1), is seen as the first demographic dividend at (t+1)th period, equation no. 12 and 13 measures the contribution of age characteristics and education characteristics to the change. Hence, the two equations provide us the age effect and education effect.

Data:

Two types of data are required for estimating ESR—population data and data on economic profiles. Population data is collected from Wittengstein Centre for Demography and Human Capital (WICD). The study developed age profile of per capita labor income and per capita consumption taking NTA dataset developed by NTA country team. NTA profiles provide series of per capita consumption and per capita labor income disaggregated by age groups. However, this study disaggregates the age profiles further by five levels of education. The study excludes the population below ages 15 since the WICD population data does not assign a level of education for them. Thus the study has 14 age groups of five years age interval and five education categories, resulting 70 observations for each of the profiles. Alternatively, each of education group has 14 observations under an economic profile. The study suggests that education is a major component in determining the income and consumption profiles along with ages. Thus it finds first demographic dividend of Bangladesh using age and education profiles of per capita labor income and per capita consumption and thereby improves the existing literatures.

WICD provides data on population which is primarily collected from United Nations Population. WICD makes some projection using the Shared Socioeconomic Pathways (SSPs). SSPs include a set of assumptions on fertility rate, mortality rate, migration and education profile of a country. The study uses three out of five SSPs and two variants of the most likely pathway (SSP2-medium). WICD projections has been done following a standard meticulous method **(Lutz,)**. However, the projection includes educational data as a major factor for projection and argues that this helps

having a better projection. As per the study's necessity, population data is cross-classified by age groups, on five years interval, and levels of education. WICD classifies the dataset in terms of six categories of education—No Education, Incomplete Primary, Primary, Lower Secondary, Upper Secondary and Post-secondary. However, it offers an option to have four categories omitting "Incomplete Primary" category and merging two secondary education types to a single category. This study makes five categories, keeping every of six categories and merging two secondary education categories. The following section briefly discusses about the SSPs.

An Overview of the Shared Socioeconomic Pathways (SSPs):

A set of projections by levels of educational attainment was produced Wittgenstein Centre for Demography and Global Human Capital and at other institutions. WICD projections also included population projections developed for the 5th assessment report of the Intergovernmental Panel on Climate Change (IPCC) according to a set of Shared Socioeconomic Pathways (SSP) scenarios. The study uses the WICD population projections by levels of education to model ESR and for further analysis except the population projections under SSP3 and SSP4. A short description of the SSPs is as following.

SSP1 (Rapid Development):

Rapid economic growth in low-income countries results the reduction in the number of population below poverty line. To achieve sustainable economic growth the country has to attain educated populations with access to safe water, improved sanitation and medical care. This storyline leads a low world population, which may not work for countries' with vulnerable socioeconomic conditions. The projection assumes that the country invest both on educational and health sector to reach the goal of a low world population. This implies assumption of low mortality and high education for the country. For rich OECD countries medium fertility was chosen as further fertility declines unlikely for them. Low fertility assumptions were picked for all other countries. Bangladesh's population in next few decades cannot fall that much to meet the goal under SSP1.

SSP2 (Medium):

This setting combines for all countries medium fertility with medium mortality, medium migration, and the global education trend (GET) scenario. In a word, this is the middle of the road scenario which can be seen as the most likely path for every country.

SSP2-CER (Constant Enrolment Rates):

Under this scenario, the attainment shares at age 30-34 of future cohorts are chosen to be fixed at the levels observed in the base year. But the projections were adjusted for the necessary cases if younger age groups in the base year already exhibit higher than predicted attainment. Bangladesh is doing well in terms of educational enrollments. So, this assumption will be too pessimistic but useful for the case if Bangladesh slides down the line.

SSP2-FT (Fast Track Education):

For this scenario, the most rapid country-specific expansion parameters are applied to all countries throughout the projection period. In another terms, all countries follow the educational development paths taken in the past by the frontrunners in East and South East Asia. This assumption is too optimistic for Bangladesh case.

SSP3 (Stalled Development):

In this case, fertility rate is assumed to be low in the rich OECD countries and high in the other countries. According to this setup the fertility rate for Bangladesh is assumed to be increased for the near future periods. As Bangladesh is trying to control the population growth and so far it has attained the positive result, this setting is not valid for the country.

SSP4 (Inequality):

This special scenario is developed to reflect the inequality in education. There is a group with very high education levels (bigger for rich countries) and group with low education levels. In terms of fertility, the national averages imply continued high fertility in today's high fertility countries and continued low fertility in today's low fertility countries. The high fertility countries are assumed to suffer from high levels of mortality conversely the other countries has medium mortality. According to this case, the population projections for Bangladesh have followed high fertility and high mortality. However, Bangladesh has successfully control the high fertility and high mortality in recent years; this setup is not applicable for this country.

SSP5 (Conventional Development):

According to the assumptions of this scenario high education and low mortality is considered across all countries. In case of fertility, relatively high fertility is assumed for the rich OECD countries (as a consequence of high technology and a very high standard of living that allows for easier combination of work and family, and possibly for immigrant domestic assistants) and low fertility assumed for all other countries. Hence, the low fertility has been chosen for the projections of Bangladesh. However, this projection also leads to a low world population that does not go with the storyline of Bangladesh.

Results:

Bangladesh was an ideal representation of the population pyramid hypothesis in 2000s (not shown in graph). Bangladesh's birth control policies changed the bottom bars of the pyramid where the population of aged under 15 dropped and the change is more visible for aged below 10 years population. Graph-1 represents this phenomenon of population control in 2010 where the bottom two bars shrank substantially. Though the birth rates fall, the upper bars are unaffected. Thus it still looks like a pyramid if aged below 10 years population is ignored. However, the projected distribution of population will not be alike pyramid in 2050. The bars in the rage 15-44 are quite similar in length and the groups ages between 5-9 and 10-14 in 2010 will be ages between 45-49 and 50-54 in 2050. The latter two groups will be larger in size compared to all other groups with 5 years age interval. It is obvious from figure-1 that 40 and above aged population with no education exhibits a pyramid shape while below 40 population does not exhibit so. This indicates that distribution of illiterate population started changing decades ago. However, the population with other types of education represents pyramid shapes across the whole distribution.

Figure-1 : Bangladesh Population in 2010

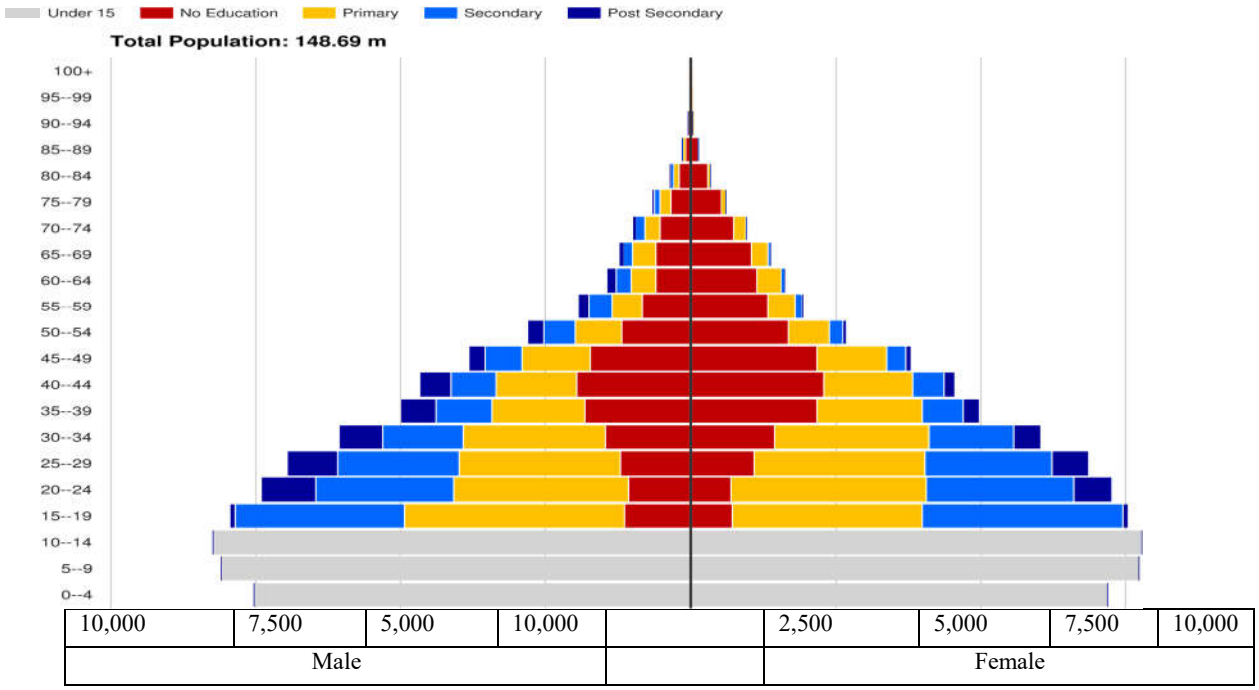
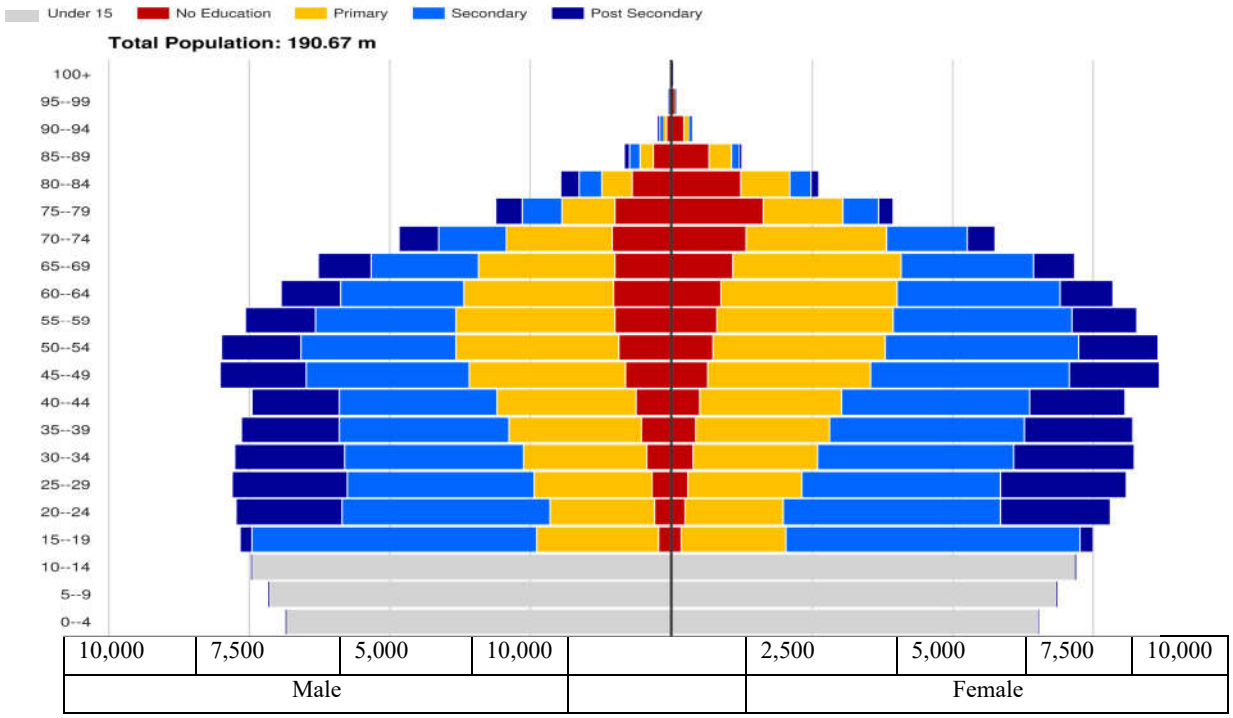
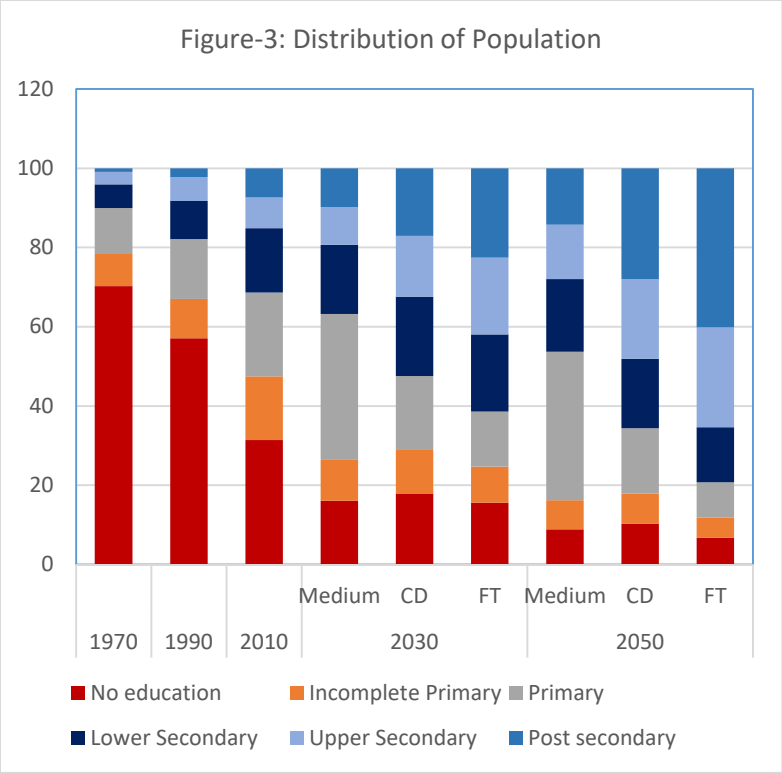


Figure-2: Bangladesh Population in 2050 (projected)



However, the post-secondary education group ages below 20 does not have larger bar as many of them are expected to still achieving the degree. The country achieved gender parity in terms of educational attainment across all categories in recent decades. In 2050, it is projected that the population with primary or no

education will get squeezed in number for all the groups aged below 50. That is the educational characteristics of working age population will be changed and gender parity will achieved at larger extent. It is projected that 65+ aged population will be increased with a little reduction in below 15 aged population, indicating that there will not be an overwhelming change in the share of dependent population.



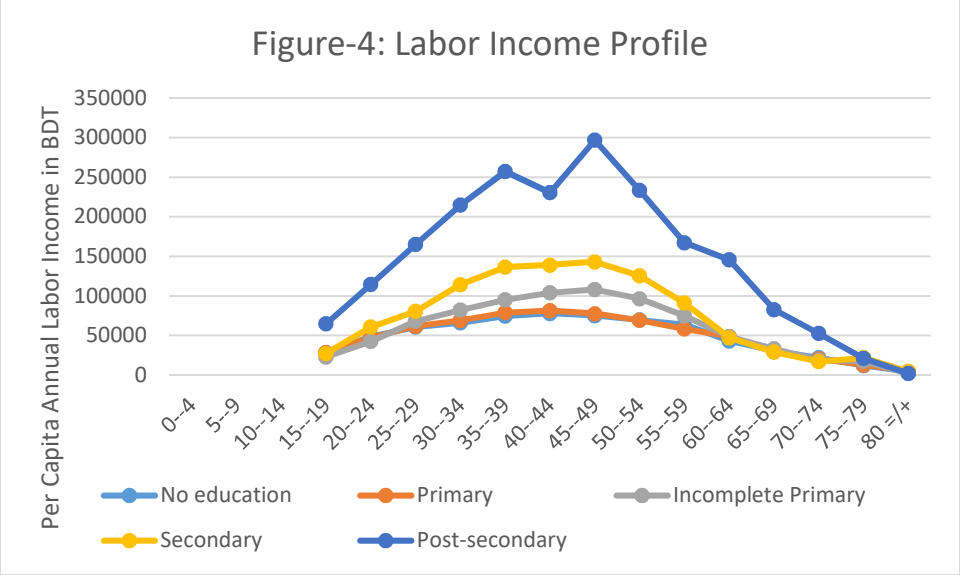
Sources: Author's calculation from WICD data

Bangladesh has achieved a considerable progress in terms of educational attainment. Starting from a one-third population with no institutional education in early 1980s, it achieved a one-third population with post-primary education in 2010. The population with no education has been fallen down to 30 percentage point. Since a variable portion of previous cohorts with their nearly unchanged educational status remains in each period, the distribution of population in terms of education is affected. However, if the distribution in near end becomes more suitable the achievement gets less affected by its demographic history. The distribution shows that the country progressed significantly in educational achievement in 2000s and the progress continued onward. If the current trends continue, Bangladesh will have 20 percentage 30 percentage of population with secondary and post-secondary certificates/degrees in 2030 and 2050 respectively (see the bars over SSP2-medium). The population below primary education will fall to 30 percentage and 15 percentage in 2030 and 2050 respectively. However, other two optimistic projections have more than 50 percentage of population have above lower secondary education, keeping population with primary or below primary education less than 50 percentage both in 2030 and 2050. This type of achievement in education is too far from the SSP2-medium scenario and does not go with the story-line of Bangladesh.

Labor Income and Consumption Profiles:

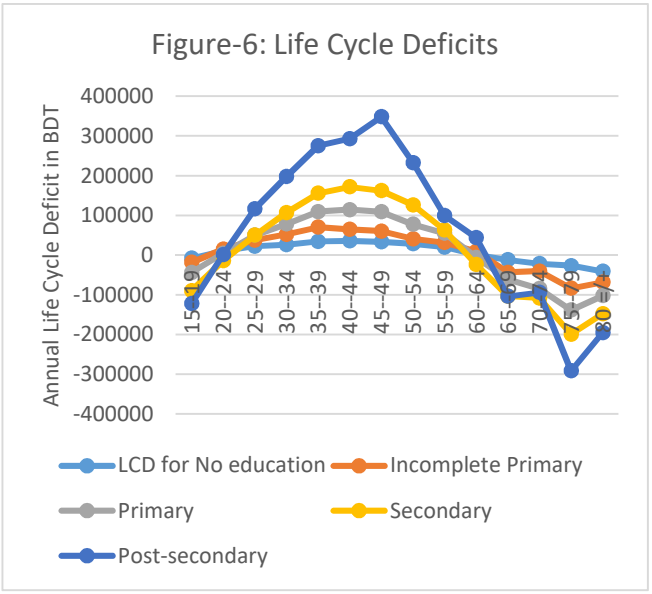
Labor income is an important variable in defining ESR. If labor income, disaggregated by age group, has a favorable profile, ceteris paribus, the employed population will be able to support more form the pool of working age population. Thus the number of effective labor increases, if labor income series moves up. On

the other hand, the consumption profile for adults does not vary much in the presence of consumption smoothing.



Source: Authors' Calculation

Figure-4 shows that the highest level of per capita annual income across different age groups is observed for the post-secondary level educated population, as expected. The population with no education has the lowest profile of per capita income across age groups. It can be deducted from the figure that the per capita labor incomes across age groups are positively associated with the educational qualification. However, the variation of annual income rises as level of education increases. This findings indicates that the expected level of annual income earned by a group with higher educational status will be lower than the simple average figures depicted in the graph. Alternatively, the groups with lower education can expect a labor income closed to the average income. This phenomenon has a broader impact on labor market competition and outcome, and will be investigated later in this study. Another important, but a regular, feature is derived from the figure that incomes at the retirement ages falls for all education groups, except post-secondary education group, and does not vary largely across education groups. Figure-5 describes the per capita annual consumption across ages for different education groups. Consumption follows the assumption of life cycle hypothesis as the income series does (see figure-4 & figure-5). There is little variation in the consumption series across the education levels and consumption is not linearly related with the income. We find an evidence, though non-linear, for consumption smoothing over the life cycle. We can infer from the life cycle hypothesis of consumption that the reason for little variation in consumption is financed by wealth accumulation over the life. The Life Cycle Deficit (LCD) is defined as the difference between income and consumption, and can also be analogized with savings. Figure-6 illustrates the Life Cycle Deficit for the education groups. The groups with post-secondary education reaches the peak in terms of life-cycle surplus (savings) at the ages 45-49, the group with incomplete primary education reaches at the ages 35-39 and the other three groups reaches at the ages



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40-44. The series of LCD reflects the shapes observed in the income series since there is little variation in consumption series.

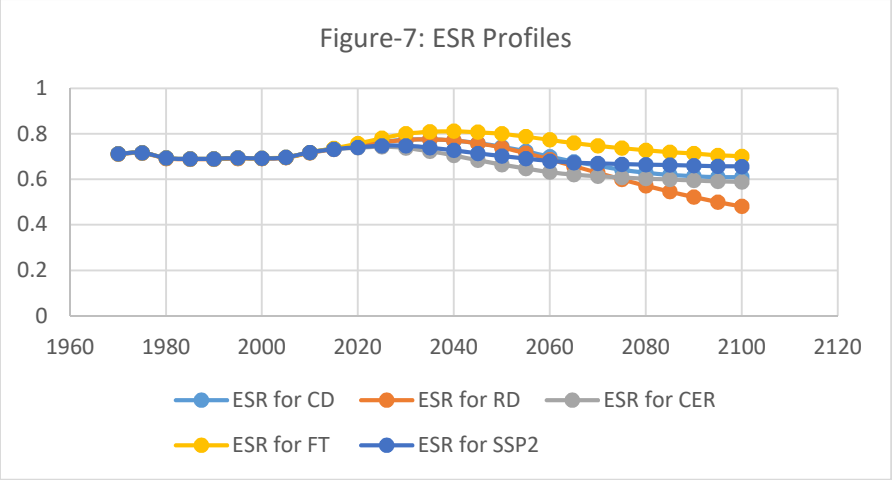
When the First Demographic Dividend ends in Bangladesh?

This question asks about a projection. We are using four relevant projections for Bangladesh to answer this question. Figure-7 illustrates the time-line when the dividend is projected to reach its peak-point. For both of the assumptions of Conventional Development and Rapid Development, the dividend will reach its maximum around the year 2035. The fast track enrollment rate under the assumption of medium scenario could extend this period by five years while the medium (SSP2) and constant enrollment rate CER (SSP2) will expedite the timeline by five years and ten years respectively. This findings hints that fast track enrollment rate can boost the support ratio and extend rising part of ESR curve for another decade. However, we cannot expect an extended period of demographic dividend as we are only a decade back from the peak of the ratio and an overhauling change is unexpected to happen.

The best fit assumption for each country in WICD database is the medium (SSP2) scenario where fertility, mortality, migration and enrollment all are set at country level medium—not having too optimistic or too pessimistic. It is assumed in SSP2 medium scenario that current trend will prevail for next one or two decades. Under SSP2 (medium) projection, the dividend will reach its maximum value in 2030. However, support ratios vary across the projections

Two important information can be derived from the time-series graph of educational status wise ESRs—**First**, the within group capacities to support its members and comparisons of ESRs across the education groups. It is evident from the graph that the curves of support ratios are placed in a way that does not exhibit a positive role of education. The group with highest observed, till 2010, ESRs is the group with post-secondary education. The ordering of position of the curved of ESRs across other levels of education is inverse to the order of educational attainment, no education, incomplete primary, secondary and primary

education groups takes position in consecutive order. This does not provide any positive evidence in favor of the effect of education on support ratios.



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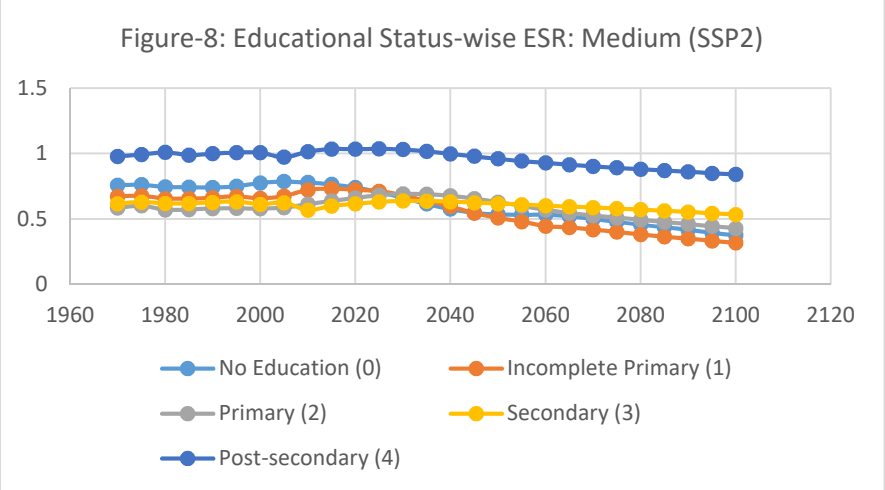

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(Figre-A3 in Appendix) explains the role of education further in a disaggregated way based on the data under the assumption of conventional development. The support ratio is the highest for the post-secondary education group and the lowest for the group with primary education group till 2010. The group with no education can support the members within the group at the second highest ratio for the same period. However, the group with secondary education can support at the lower rate than the incomplete primary education group.

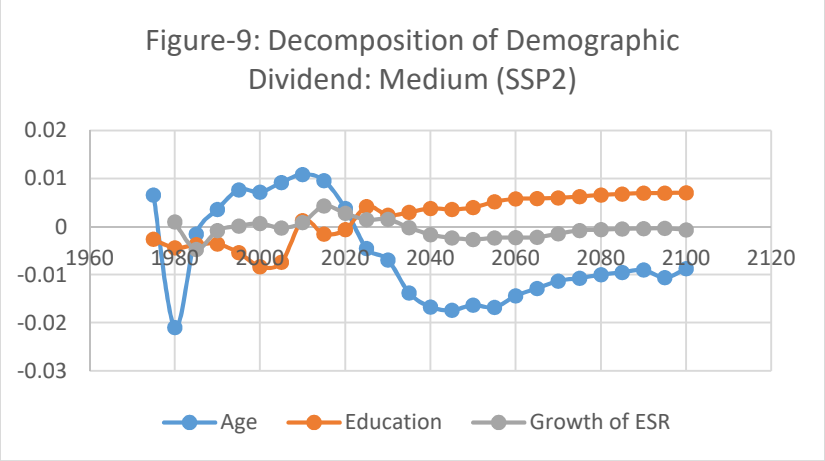
Secondly, projection on when the groups will reach the peaks of tis respective support ratios. From the observed data, we cannot differentiate the contribution of education in terms of support ratios since the behavior of education wise ESRs is erratic. However, for the future horizon, education would play an important role in the demographic dividend. The peak of group-wise support ratios are associated with the levels of education. Two groups of population at the lower end of educational attainment have already crossed the apex point in the series of support ratio—the group with no education reached it 2005 and the

group with incomplete primary education reached it in 2015. The primary education group is projected to reach the maximum in 2015 while the primary, secondary and post-secondary, educational groups will reach it in 2025, 2030 and 2035. It is clear that the intra-group support ratios meet the peak of first demographic dividend in an order which is positively related with educational attainment if the case of post-secondary group is kept aside. The groups at lower end of education have already reached its optimum support point and the other three groups have still-burgeoning support series.

Though the first type of information invalidate the role of education in support ratio because of erratic pattern across education groups, the second type of information exhibits that the educational attainment plays a positive role there. In a changing scenario over future horizon, the population with a higher level of education will support for a longer period and vice versa. The question remains why the past experience did not provide evidence for positive role of education.

Decomposition of Demographic Dividend: Age Effect and Education Effect

Support ratio alone cannot explain whether the increasing (decreasing) trend is dominated by the change in age structure only, due to change in knowledge (education) paradigm or both. Finding source(s) of demographic dividend in terms of policy suggestions is important. There is a debate whether demographic dividend is purely an age effect. To address the debate, the study decomposes the ESR in two major component, age and education, and a residual component.

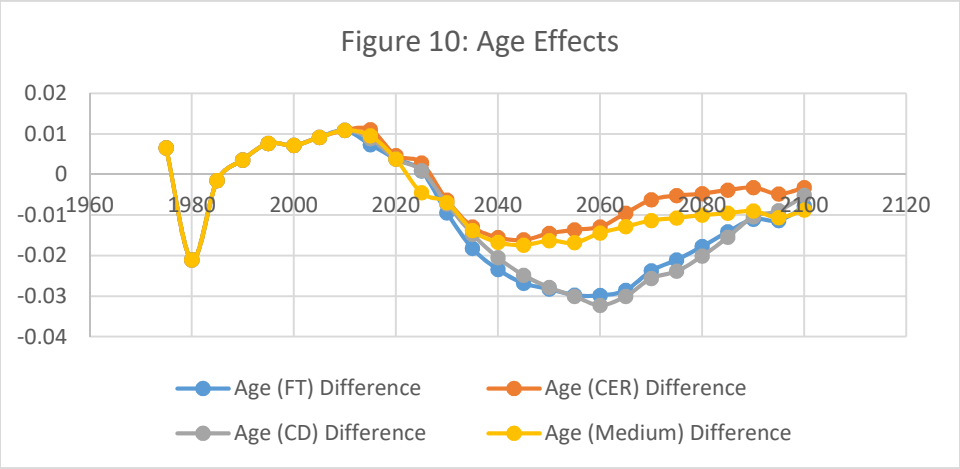


Source: Authors' Calculation

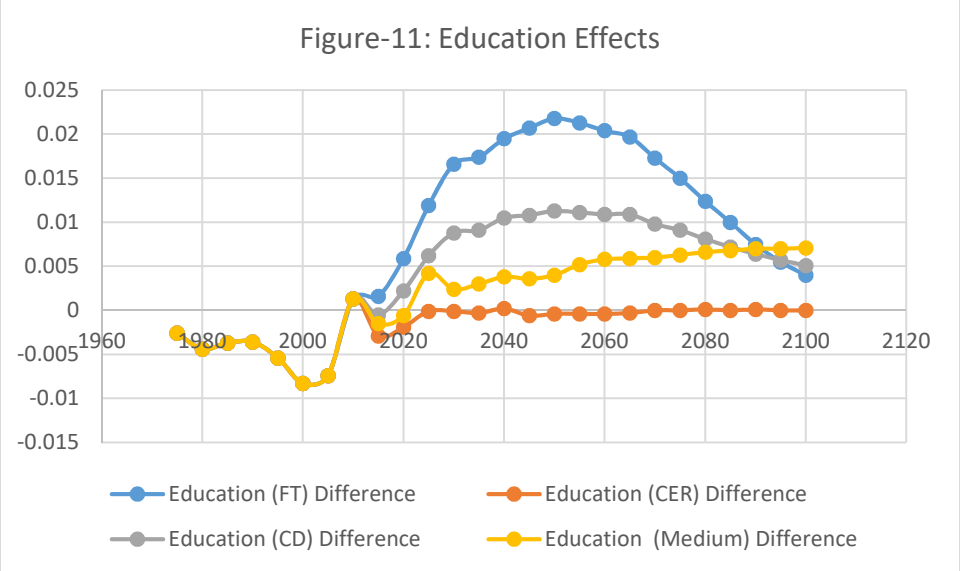
Figure-8 graphs three curve—the gray curve shows the change in ESR or the demographic dividend, blue curve is the curve showing education effect and the red curve show the age effect. Age effects and Education effects are found by decomposing the demographic dividend or change in ESR. The sum of the latter two curves will be close to the first curve since there is a residual curve. The demographic dividend prior to 1990 was negative, except the period the period 1970. A historical event occurred, a war, in 1971 which affected the working age population. Probably, the series contains the aftermath of the event till 1990 but this is not conclusive. The support ratio remained stagnant until 2005 and started growing after 2005. For the assumption of conventional development, it will grow till 2040 and reach the apex where the growth in ESR is zero. It is projected that 2040 will be followed by a longer period of negative ESR growth.

For the period 1990-2015, the positive growth in ESR is associated with positive age effect and negative education effect, if we skip the period 2010. So, we can argue using this evidence that Bangladesh did not experience a positive effects of education to demographic dividend and the dividend was dominated by the

pure age component. However, post 2020 ESR growth (dividend) will be accompanied by the two effects in reverse direction-- positive education effects and negative age effects. This projection indicates that the future is not as gloomy as the past. What are the pictures of age effect and education effect under other projections? Figure-10 and figure-11 answer this question. It is visible that the age effect will be negative for all four projections. For the CER case under the assumption of medium scenario (SSP2), the age effect curve under lies above any of other three curves for age effect. The curve representing sustainable development scenario has the least age effect and medium education effect. The fast track education under middle-of-the-road scenario has the highest education effect while having medium age effect. The age effect and education effect under the conventional development assumption lie middle of the other projections. Maintaining constant enrollment rate under medium SSP scenario has the average age effect closer to the horizontal axis. The study suggest to consider medium (SSP2) scenario for Bangladesh and presents other three scenario to compare what would be if the country slides down or up to a specific scenario. For closer assumption to reality, medium (SSP2), the education effect will be positive after 2020 but could not make an extended period of demographic dividend compensating a larger negative age effect.



Source: Authors' Calculation



Source: Authors' Calculation

To make a general comment, education effects are higher for Fast Track enrollment scenario. The demographic dividend is also larger for the same SSP2 projection with Fast Track enrollment (figure-, appendix). However, the age effect and education effect of the most likely projection (medium-SSP2) is closer to the CER scenario and far from the FT scenario. Enrollment rates in fast track countries in in East and South East Asia do not suit for Bangladesh because of the differences in age structures and educational attainment in these countries. It can be argued that Bangladesh could not perform best in capturing education effect.

Discussion:

This study finds different sets of support ratio compared to Khandaker & Rahman (2017). One of the finding is that the support ratio from an aggregate measure can vary if the dataset is further cross-classified. Our data is cross-classified by ages and levels of education which differ from many cutting-edge studies on demographic dividend. There are two reasons for differences in the estimates of ESR. Firstly, Lutz () argues that education is an important factors in population projection. Thus this leads to differences in projected values and make changes in the support ratio in future horizon. Secondly and most importantly, per capita age profiles of labor income and consumption of aggregate population varies from per capita age profiles estimated from different population group disaggregated by levels of education. This aspect diminished the values of ESRs for Bangladesh because the population series of Bangladesh is largely dominated by the group with no education or little education. Since the population with lower education achieves low levels of income, the number of effective labor within those groups fall. On the other hand, the numbers of effective consumers do not fall much in the presence of public consumption. The second reason explains why the working age population in Bangladesh can support a less number of population. The study argues that this findings on comparative studies may prevail for other countries having similar population composition based on the relationship between education and labor market outcome. In peak point of the ESR curve, working age population in Bangladesh can support 75 percent of its population and the range of ESR lies in the interval 66%-75% under SSP2-medium scenario and the current rate is about 73%. Who supports the rest of the consumers or dependent population? The answer is that they are supported by the Government of Bangladesh (GoB) through some mechanisms, say the social security schemes. It is important to note that the ability of government to support its population is dependent on its revenue collection. So, it is important for governments to sustain and improve the revenue collection.

Another question raises whether the population could support more of its consumers? The answer remains dependent on the features of wage distribution. We are unsure about how we could make support ratio high enough through wages. The study talks about labor income which is necessarily from labor activities. If the labor income gap between active age population, of ages between 30-49 years, and other age groups could be diminished so that the wage ratio would be unity or greater than unity for more age groups. Per capita relative consumptions, which includes both public and private consumption, are higher than per capita relative income for nearly every age group, irrespective of education level. This aspect brings forth the issue of productivity and human capita across ages. Though NTA methodology assumes that population aged between 30-49 years have higher per capita ratio of income relative to consumption, it does not state how much heterogeneity would be accepted within this 30-49 aged population. It is expected that job market experiences would add values to labor income. Two channels are important to have a favorable alternative labor income profile. First, a country should have a higher proportion of population to high income groups. Secondly, pulling up the income of groups with within-group higher proportion of population. As we see from the evidence that higher income groups have higher per capita income but less within-group population. This evidence suggests that both of the channels to improve labor income profile are at odd for

Bangladesh case. The challenge for Bangladesh is to make a population composition with high proportion of higher earning groups.

To understand the labor income profile, a closer investigation of labor market is required. According to BBS Labor Force Survey (2015-2016), the rate of unemployment is the highest among the group with tertiary education. This might be a result of producing larger than optimum number of university graduates. If a group of population has a higher percentage of unemployed population, the support ratio for the group scales down, showing the fact that the group has higher number of economically dependent population. The data on income contains more than 50 percentage of employed population with zero income. This 'labors with zero wage' comes from unpaid family worker or self-employed population. Self-employed population add values to a country's economic production and receives sales revenue or profit in return but not in the form of wages. However, unpaid family workers might be unemployed because of having no better option available at their hand and, possibly, they are employed there as surplus labor. The second group dampens the labor income profiles and lowers the support ratio.

How smoothly Bangladesh is facing this challenges is required an investigation. LFS 2009-2010 shows that 20 percentage among the 15-30 ages population reports them as students. Of the remaining 80 percentages, it is expected that they should be merged with the labor force. Another alarming statistics is that about 30 percentage of the ages between 25 and 30 are not either in education or in labor force. However, about half of 15-30 age population is out of labor force. Another labor force survey conducted five years later shows that more than one-third of the population who were in the age interval 15-30 in 2009-2010 is still out of labor force. If we take a closer look to young cohort ages between 25 and 30, there was only 4 percentage student in 2009-2010 period, but the 36% of this age group is out of labor force. In 2015-2016 period survey, there is still 33 percentage of these youths who are not in labor force. The improvement during this 5 to 6 year period is not significant. It is visible from the findings that there might have some barriers to make an entry to labor force. The female population constitutes most of this "not in labor force" population, traditionally. This phenomenon raises the issue of dependent population within the group of working age population that makes an additional plight to support ratio. Lower female labor force participation rate is a big concern but it is unlikely that the situation will be improved in near future. Percentage of population working in formal sector is another reason for lower support ratio. Population working in informal sector does not have advantages of pension or provident fund. The concern remains how this group will be supported after their retirement. Traditionally, grown up children take the responsibility of supporting their parents at their old age. Support for the senior citizens from GoB is limited and insufficient. Thus, effect of informal sector centric labor market on support ratio is negative.

Since the first demographic dividend ends by 2025-2035, it will be too optimistic to overcome all the barriers within this short length of time. However, there is still hope and possibilities to make best out of it.

Conclusion:

The study attempts decomposing and examining the first demographic dividend in Bangladesh. Since the outcomes through education are resulted from the investment in educational sector, educational investment should have been revisited based on the diagnostic check obtained from the study. The findings from the study is not much shining for Bangladesh while it maintains current trends in educational investments. The finds following results obtained through its methodology and data.

1. First demographic dividend in Bangladesh ends by the period 2030. This timeline could be extended by five to ten years if population distribution can make the share of educational attainment higher. That

does mean that if the population with lower education could be diminished and population with higher level of education could be stirred up, the support ratio will increase and thus the peak of support ratio would be found few years later. Though this is statistically possible, it is the toughest job to accomplish it within a decade.

2. Education Effect to the demographic dividend was negative throughout the last four decades of Bangladesh.
3. It is projected that economic support ratio in future will be accompanied by negative age effect and this negative effect will be mitigated by positive education effect at some extent.
4. Labor income profile was not demographic dividend stimulating though this is import to have a favorable progress in support ratio.
5. The challenge for the Government of Bangladesh is to keep a vigilant focus on how to mitigate negative age effects and to support low educated population, retired from informal sector employment, at their old age.

The focus of the study was limited to the first demographic dividend of the country. The study finds presence of moderate support ratio which further indicates the importance of the government to have a mediating role, in goods market, especially in education and health sectors. Since the country has been primarily escalated to the category of Lower Middle Income Country (LMIC) and is expected to have the status finally within few years, financial assistance and grants from international communities will fall. The country must finance the support schemes on an alternative self-dependent module. This has an implication for its internal revenue collection and foreign direct investment. Though the timeline found in the study has implications for the country, we cannot categorically state that all opportunities will be gone by that time. For comparative analysis, Bangladesh is expected to have a handsome quantity of young population that could have used more efficiently. Education investment can be a channel to alter the future that is being projected. The study found no strong clue to predict that the female labor force participation scenario will be dramatically changed in near future. It is also frustrating that the youth population did not impact positively in labor market.

The study recognizes that a general equilibrium analysis would find better recommendations for the labor market. Further study can be taken using general equilibrium technique to analyze the possibility of capitalizing demographic dividend. The second demographic dividend or the role of future savings was not to the concern of this study, and thus unable to comment on what will be the future second demographic dividend.

Appendix:

Table A1: Labor Force characteristics of 15-30 years aged population

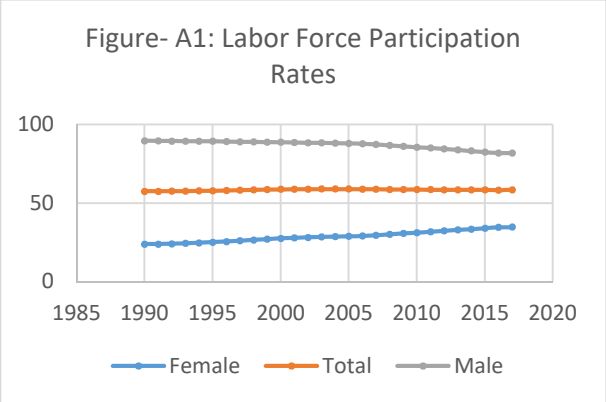
LFS 2009 - 10 (age 15 to 30)				LFS 2015 - 16 (age 21 to 36)	
Status	**Percent**	**Educational Status**	**Percent**	**Status**	**Percent**
Included in labor force	50.6276	**Student**	**20.37**	Included in labor force	63.18
Not in labor force	49.3723	Not Student	79.63	Not in labor force	36.82
Total	**100**	Total	100	**Total**	**100**

Source: BBS Labor Force Surveys

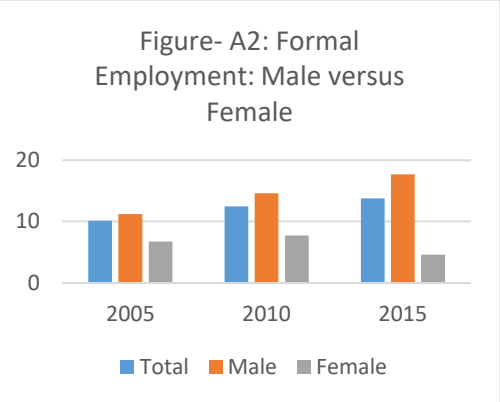
Table A2: Labor Force characteristics of 25-30 years aged population

LFS 2009 - 10 (age 25 to 30)				LFS 2015 - 16 (age 31 to 35	
Status	**Percent**	**Educational Status**	**Percent**	**Status**	**Percent**
Included in labor force	64.2382	**Student**	**3.78**	included in labor force	67.24709
Not in labor force	35.7618	Not Student	96.22	not in labor force	32.75291
Total	**100**	Total	100	**Total**	**100**

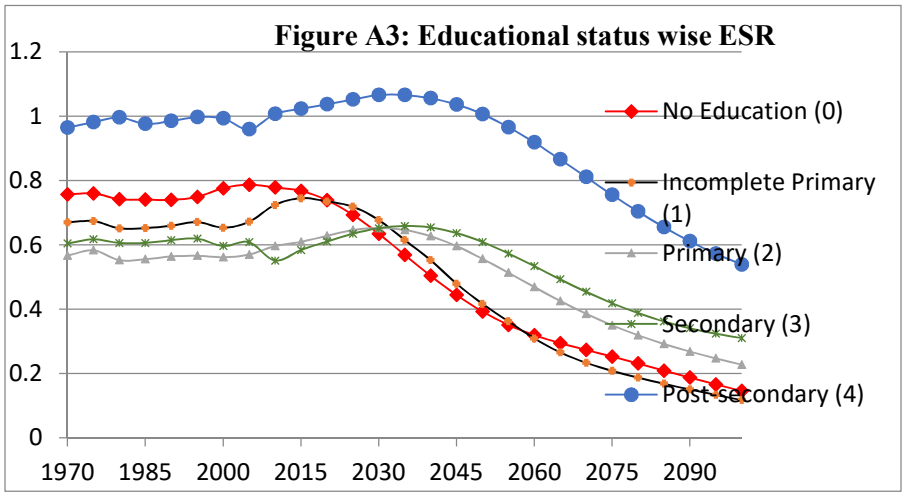
Source: BBS Labor Force Surveys



Source: World Development Indicators



Source: BBS Labor Force Surveys



Source: Authors' Calculation

References:

Ando, A., & Modigliani, F. (1963). The" life cycle" hypothesis of saving: Aggregate implications and tests. *The American economic review*, *53*(1), 55-84.

Bangladesh Bureau of Statistics (Various Years). *Report on The Labor Force Survey*

—— (Various Years). *Report on Household Income Expenditure Survey*

Becker, G. S., & Lewis, H. G. (1973). On the Interaction between the Quantity and Quality of Children. *Journal of political Economy*, *81*(2, Part 2), S279-S288.

Bloom, D. E., & Freeman, R. B. (1986). The effects of rapid population growth on labor supply and employment in developing countries. *Population and Development Review*, 381-414.

Bloom, D. E., & Williamson, J. G. (1998). Demographic transitions and economic miracles in emerging Asia. *The World Bank Economic Review*, *12*(3), 419-455.

Chaudhury, R. H. (2014). Will Bangladesh seize or squander the economic opportunity offered by the demographic dividend?. *Asia-Pacific Population Journal*, *29*(2).

Coale, A. J., & Hoover, E. M. (1958). Population growth and economic development in low-income countries. *Princeton University Press.*

Cuaresma, J. C., Lutz, W., & Sanderson, W. (2014). Is the demographic dividend an education dividend?. *Demography*, *51*(1), 299-315.

Deaton, A., & Zaidi, S. (2002). *Guidelines for constructing consumption aggregates for welfare analysis* (Vol. 135). World Bank Publications.

Gupta, P. D. (1993). Standardization and decomposition of rates: a user's manual (No. 186). *US Department of Commerce, Economics and Statistics Administration, Bureau of the Census.*

Khan, M. R. (1984). Economic Development and Population Policy in Bangladesh. *The Bangladesh Development Studies*, 1-18.

Khondokar, B. H. & Rahman, M. M. (2017). evsjv‡`‡k RbmsL¨vZvwË¡K myweavi cÖv°jb: b¨vkbvj UªvÝdvi GKvD›U c×wZi Gi cÖ‡qvM, *Bangladesh Unnoyon Somikkhya*

Khondokar, B. H. & Rahman, M. M. (2016). Will Bangladesh miss out on first demographic dividend?. *Thinking Aloud.* Volume 2, Issue 8

Kitagawa, E. M. (1955). Components of a difference between two rates. *Journal of the American Statistical Association*, *50*(272), 1168-1194.

Lee, R., & Mason, A. (2010). Fertility, human capital, and economic growth over the demographic transition. *European Journal of Population*, *26*(2), 159-182.

Mason, A., Lee, R., Abrigo M. & Lee, S. (2017). Support Ratios and Demographic Dividends: Estimates for the World. *UN Technical Paper,* 2017/A.

Oaxaca, R. (1973). Male-female wage differentials in urban labor markets. *International Economic Review*, 693-709.

Rentería, E., Souto, G., Mejía-Guevara, I., & Patxot, C. (2016). The Effect of Education on the Demographic Dividend. *Population and Development Review*, *42*(4), 651-671.

Rahman, R. I. (2014). Demographic Dividend and Youth Labor Force Participation in Bangladesh. *Bangladesh Institute of Development Studies,* Research Report No. 187

Samir, K. C., & Lutz, W. (2014). Demographic scenarios by age, sex and education corresponding to the SSP narratives. *Population and Environment*, *35*(3), 243-260.

Vargha, L., Gál, R. I., & Crosby-Nagy, M. O. (2017). Household production and consumption over the life cycle: National Time Transfer Accounts in 14 European countries. *Demographic Research*, *36*, 905-944.

University Grants Commission. (2006). *Strategic Plan for Higher Education in Bangladesh: 2006–2026.*

University Grants Commission. (2011). *Annual Report 2011.*

Wittgenstein Centre for Demography and Global Human Capital (2015). Wittgenstein Centre Data Explorer Version 1.2. http://www.wittgensteincentre.org/dataexplorer.