Demographic Dividend, Human Capital and Poverty Reduction*

By

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Abstract

Even though demographic transition has been found to beneficial to the general public in various aspects, there is no guarantee that these benefits will be triggered down to the poor. This paper studies the impact of demographic transition on poverty alleviation through human capital formation. We examine four deprivation in education and health indicators from the Multidimensional Poverty Index (MPI). We find evidence that demographic transition reduces deprivation in school attainment of the poor. However, we find no evidence that demographic transition reduces deprivation in school attendance, nutrition and child mortality of the poor.

JEL Classification: I32, J11, J13

Keywords: demographic transition, fertility reduction, multidimensional poverty index, MPI, poverty alleviation

I. Introduction

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“The world is entering unfamiliar territory” (Bloom, 2011). According to the World Population Prospects: 2015 Revision, in 1990, there was 5.3 billion people in the world. By 2100, the world population is projected to increase by another 5.9 billion. Among the 11 billion people in 2100, about 10 billion are in today less developed countries (4.8 billion in Asia and 4.3 billion in Africa).

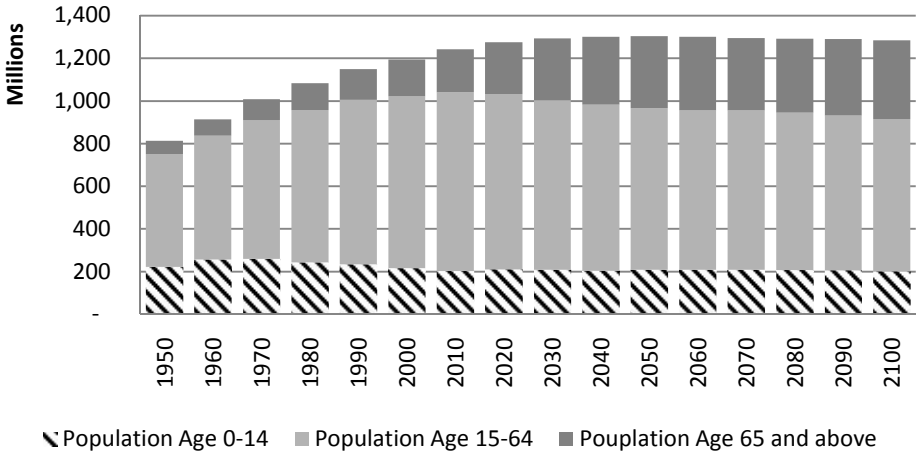
Demographic transition refers to the transition that the birth rate and the death rate fall. In all cases, the fall in the death rate precede the fall in the birth rate (Chesnais, 1992; Dyson, 2010; Bloom, 2011). Death rate has been significantly lower in most countries due to advancement in medical science, better sanitary system and healthier nutrition. It is the high death rate that also encourages families to have many children (to raise the chance that there remains some children left when many of them are not likely to survive in the high death rate environment). But with the lower death rate, this reduce the demand for children and lowers the birth rate. However, it takes time before the lowering of the death rate induces the lowering of the birth rate.

This transition has a significant impact on the composition of population in any countries. During the period that death rate is lower but the birth rate remains high, there are a lot of baby. A cohort born during this period is often called “the baby boomer” generation. When this cohort is young, the share of younger population (those younger than 15 years of age) will be high. But when this cohort enters the working age (15 to 65 years of age), the share of working-age population will increase. This is associated with demographic dividend which will be discussed more below. Finally, as this cohort retires, the share of working-age population will reduce while the share of older population will increase. This gives rise to the ageing society.

Figure 1 demonstrates the composition of population in more developed countries by age while Figure 2 does the same but for the less developed countries. For the developed countries, the share of the working-age population is decreasing. On the other hand, the share of older population (aged 65+) is expected to increase significantly. For the less developed countries, the share of the working-age population is still expected to increase. As typically noted in the literature, demographic transition in less developed countries started later. But around the end of this century, the growth in the working-age population in the less developed countries will start its decline. A concern that some fear that this will derail the economic development and poverty alleviation in the less developed countries.

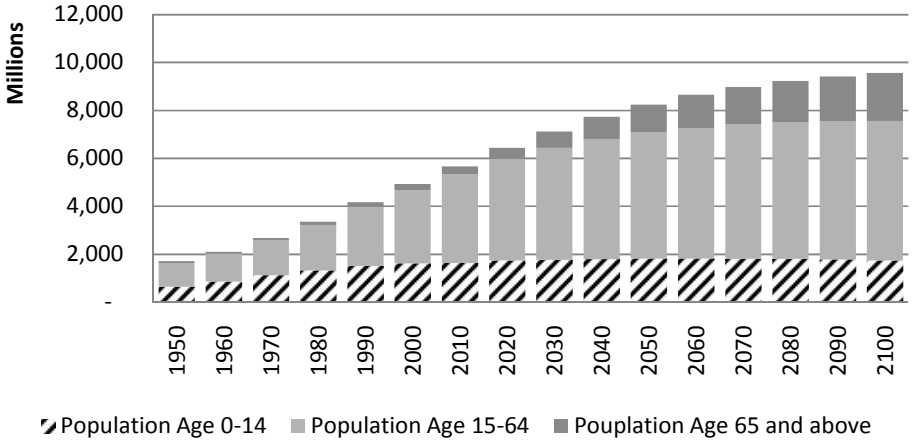
The share of older population is also expected to increase at a rapid rate. In 2015, there was about 1 billion people aged 65 years and above. By 2100, this number will increase to 3 billion. Most of this increase will be concentrated among the less developed countries.Another important factor that affects the composition of population especially for the older population is the increase in longevity. According to the World Population Prospects: the 2015 revision, the life expectancy at birth in developed countries has increased from 65 years to 78 years between 1950 and 2010. For less developed countries, this has increased from 42 years to 68 years during the same period.By the year 2045-2050, the life expectancy at birth for developed countries is projected to increase even more to 83 years while this is projected to increase to 75 years for the less developed countries. This is another important factor that contribution towards population ageing.

Figure 1: The composition of population by age in more developed countries from 1950 to 2100 (projected)



Source: World Population Prospects: The 2015 Revision

Figure 2: The composition of population by age in less developed countries from 1950 to 2100 (projected)



Source: World Population Prospects: The 2015 Revision

In this paper, we explore one important area that could be affected by demographic transition but is largely neglected in the literature. This paper studies the impact of demographic transition on poverty. There are extensive studies that examine the impact of demographic transition on economic growth or productivity (e.g. Bloom and Williamson, 1998;Kögel, 2005; Bloom, Canning, and Sevilla, 2004; Feyrer, 2007, 2008, 2011; Mason and Lee, 2006; Cuaresma, Lutz and Sanderson, 2014). Several channels that demographic

transition could affect economic growth or productivity have been identified (e.g. the 1st and the 2nd demographic dividend, education dividend, health, innovation capacity and idea adoption, and female labor force participation). However, research that examines the impact of demographic transition on poverty is scarce. Even though some aspects of demographic transition have been found to benefit the "general public" (e.g. economic growth). There is no guarantee that this will be triggered down to the poor.

In order to examine the impact of demographic transition on poverty, we rely on the data from the Multidimensional Poverty Index (MPI) developed by the Oxford Poverty and Human Development Initiative (OPHI) and the United Nations. The MPI measures poverty using various dimensions rather than relying solely on income or consumption. In this paper, we focus on the impact of demographic transition on poverty alleviation though human capital formation. Given this, we examine the impact of demographic transition on four deprivation indicators from MPI: i) school attainment ("no household member has completed at least six years of schooling"), ii) school attendance ("a school-age child (up to grade 8) is not attending school"), iii) nutrition ("a household member is malnourished"), and iv) child mortality ("a child has died in the household within the five years prior to the survey"). The first two indicators capture education aspect while the last two capture the health aspect of human capital formation for the poor.Our measure of demographic transition is the fertility rate growth.

We find that demographic transition reducesdeprivation in school attainment of the poor. This is consistent with the quantity-quality tradeoff in fertility decision. With lower fertility rate, poor household invest more in the quality of human capital. However, we find no evidence that demographic transition reduces deprivation in school attendance, nutrition and child mortality of the poor. We also find that economic growth reduces deprivation in school attainment and child mortality of the poor. Interestingly, we find no evidence on the supply-side argument for human capital formation for the poor. In particular, we find no evidence that government spending on education and health reduce any of the four deprivation indicators.

II. Literature review

The fall in the fertility rate could be beneficial for several reasons. First, the reduction in the fertility rate lowers population growth. Classic growth regression studies of Barro (1991) and Mankiw, Romer and Weil (1992) found that high population growth rate detriments economic growth.

Second, the reduction in the fertility rate increases the share of working-age population and lowers dependency ratios. Bloom et al. (2009) found negative relationship between fertility and female labor force participation (using abortion law as an instrument). Thus, reduction in the fertility rate increases the female labor participation, lowers

dependency ratios and positively affect economic growth.In the panel data regression analysis of Brander and Dowrick (1994), they found that the reduction in the birth rate has (short to medium term) positive effect on income per capita through reduction in dependency ratios. Bloom and Williamson (1998) coined the term "demographic gift" (in which, it has been called "demographic dividend"). Demographic dividend refers to the benefits of demographic transition. Demographic dividend has been classified into two types: the 1st demographic dividend and the 2nd demographic dividend.

Following Mason and Lee (2006), the 1st and the 2nd demographic dividend can be distinguished according to the following equation. Let *Y(t)/N(t)* represents income per effective consumer. Then, income per effective consumers can be decomposed into two components:

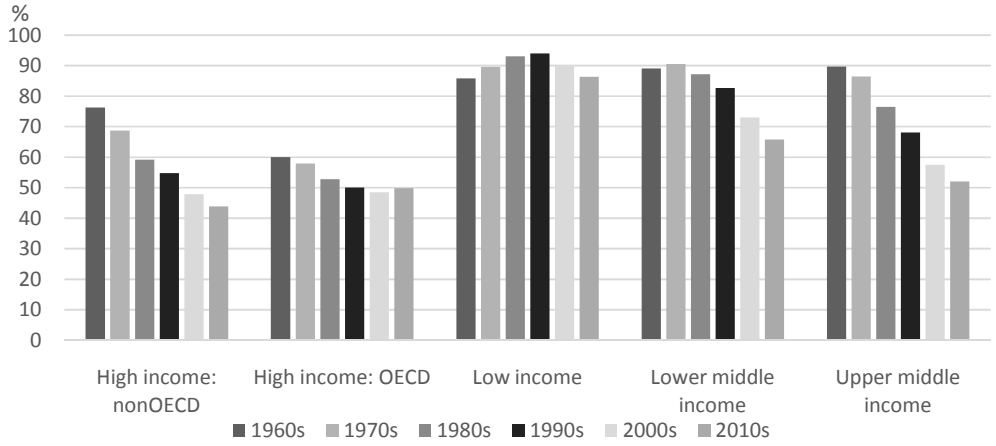
$$\frac{Y(t)}{N(t)} = \frac{L(t)}{N(t)}\frac{Y(t)}{L(t)}; \quad (1)$$

where the first term in right hand side,*L(t)/N(t),* is defined as the support ratio which captures the relative size of the working population (i.e. labor per effective consumer) and the second term in the right hand side,*Y(t)/L(t),* is output per worker which capture the productivity of the economy.

The support ratio represents the 1st demographic dividend. The 1st demographic dividend occurs during the initial phase of demographic transition. During this period, a country experiences an increase in the working-age population (*L(t)*grows faster than *N(t)*) which can increase output per effective consumer and spur economic growth. This increase arises as the drop in the mortality rate occurs earlier than the drop in the fertility rate. This unsynchronized drop in the mortality rate and the fertility rate during the early phase of demographic transition causes an increase in the population growth. A cohort that born during this period is often referred to as the "baby boomer generation". As this cohort enters the labor market when their age approach the entry age, the size of labor force will increase. However,the 1st demographic dividend is definitely transitory in nature. As the baby boomer generation enters their retirement age, the support ratio will start to fall which denotes the end of the 1st demographic dividend. One way to (indirectly) illustrate the change in the support ratio is to examine the share of working-age population.[1]Figure 3 shows the share of working-age population in the world while Figure 4 shows the share of working-age population in Asia.

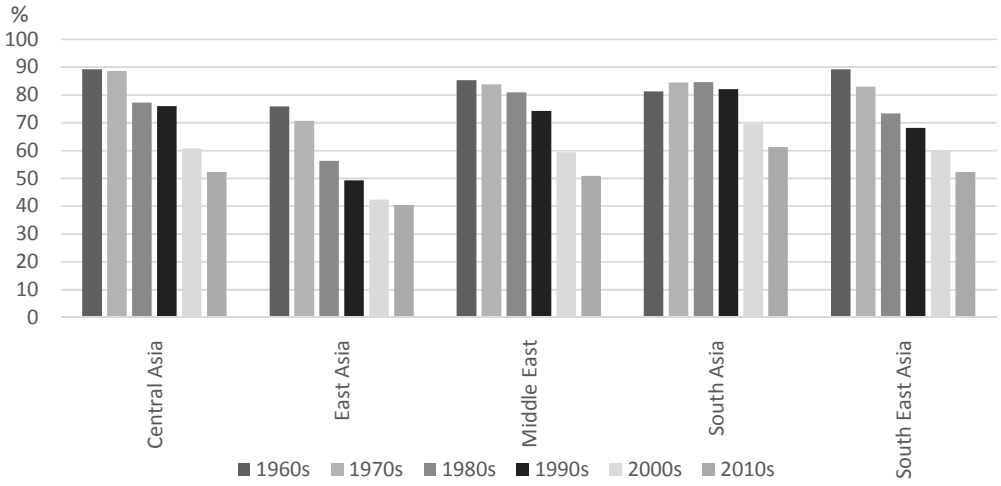
Figure 3: The share of working-age population in the world

[1]The direct way is to examine the support ratio calculated based on the national transfer account approach. However, at the moment, there are 40 countries with consumption and income profiles. In the future, it will be an interesting research question to examine the relationship between demographic dividend and poverty reduction using data directly from the national transfer account.



Source: Author constructed from the World Development Indicators

Figure 4: The share of working-age population in Asia



Source: Author constructed from the World Development Indicators

According to Figure 3, low income countries have the highest share of working-age population. Also, we can see that the share of working-age population is declining in all group of countries. The period of the 1st demographic dividend for the high income countrieshas ended. For middle income and low income countries, the period of the 1st demographic dividend will end soon (for some, it has already ended).Focusing on Asia, East Asia has the lowest share of the working-age population while South Asia has the highest share of the working-age population based on Figure 4. Many countries in Asia are less developed countries and have not fully exhaust the 1st demographic dividend. Low income countries, thus, will have a bit more time to enjoy the 1st demographic dividend. Therefore, it is critical for these countries to reap the benefit for the 1st demographic dividend as much as possible since the 1st demographic is a one-time opportunity.

The second term in the right hand side of equation (1) represents the 2nd demographic dividend. Essentially,the 2nd demographic dividend focuses on the increase in productivity that arises from demographic transition. There are several reasons that demographic transition could increase productivity. Assuming that people in the economy is forward-looking. With this assumption, they will accumulate assets during their working year in order to have enough wealth to support their consumption after retirement (thus, dissaving after retirement). This pattern of saving and dissaving is referred to as the life cycle hypothesis of Modigliani (1966). This pattern of saving and dissaving has also been well-documented across many countries under the National Transfer Accounts project. Therefore, with increase in the working population under the 1st demographic dividend, the accumulation of assets in the country will increase.[2]The accumulated assets can be invested domestically or internationally. The direct return (for investing domestically) in the form productivity enhancement as well as the indirect return (for income earned from investing in foreign countries) will increase income per effective consumers.

The third reason that the fall in the fertility rate could be beneficial is that the reduction in the fertility rate increases the share of physical investment. Brander and Dowrick (1994) found that high birth rate reduce economic growth thorough investment effect and capital dilution. Fourth, the reduction in the fertility rate increases education of woman and children. Miller (2010) found that postponing the first birth (which is also associated with fertility reduction) has positive effect on education of woman especially for the younger woman. Rosenzweig and Zhang (2009) found that higher fertility reduces educational attainment in China. Lee and Mason (2010) studied the quality-quantity tradeoff in human capital formation. They found that a reduction in the fertility rate increases the school attainment of children. Cuaresma, Lutz, and Sanderson (2014) and Cedar et al. (2015) argued that demographic dividend is essentially the education dividend. That is, the productivity enhancement that we witnessed is due to human capital formation (which is correlated but not caused by changing age structure). Finally, the reduction in the fertility rate increases health of woman and children. Schultz (2009) found that reduction in the fertility has positive effect on health of woman and children. Ashraf, Lester and Weil (2008) demonstrated the positive effect of health on human capital.

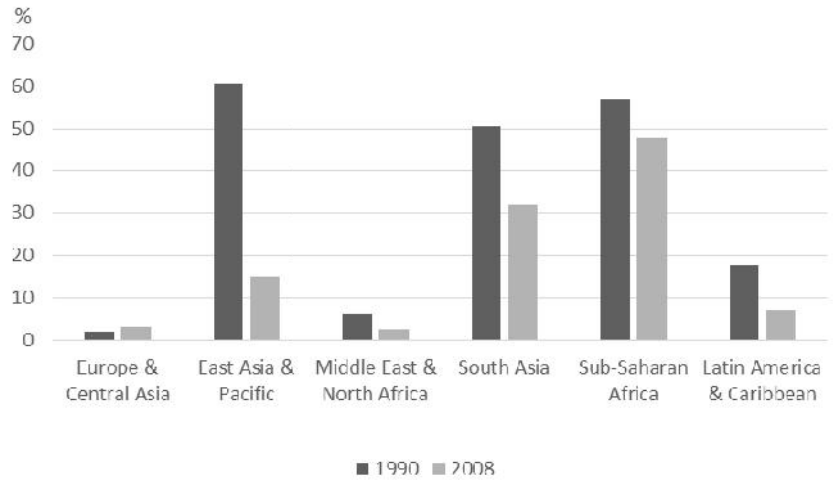
All the above represents channels that demographic transition has been found to be beneficial to the general public.However, there are only a few studies that examine the impact of demographic transition on poverty alleviation (e.g. Ahmed et al., 2014 whom focus on Africa). However, it is an empirical question to examine whether the benefit has been triggered down to poor or not. Next section we describe our econometric methodology and the data used.

III. Econometric methodology and data

[2]An increase in the life expectancy can be another factor that help boost asset accumulation. With longer period of life after retirement, forward-looking people will save more.

Our analysis is based on a linear regression model. Our dependent variables are measures of poverty. There are two approaches in measuring poverty: direct approach and indirect approach. The indirect approach relies on income. This is considered to be the traditional approach and the most commonly used approach in measuring poverty. In this approach, a threshold that defines the level of income that would be enough to sustain the minimum level of basic needs for human being is selected. It is common to measure poverty by counting the number of people living below the international poverty line (the international poverty line in the past was $1 a day (with purchasing power parity or PPP adjusted) which has recently been increased to $1.90 a day (with PPP adjusted) in October 2015). Figure 5 shows poverty headcount (using $1.90 a day) of selected regions in 1990 and 2008.

Figure 5: Poverty headcount ratio at $1.90 a day (2011 PPP) of selected regions (% of population)



Source: Author constructed from the World Development Indicators

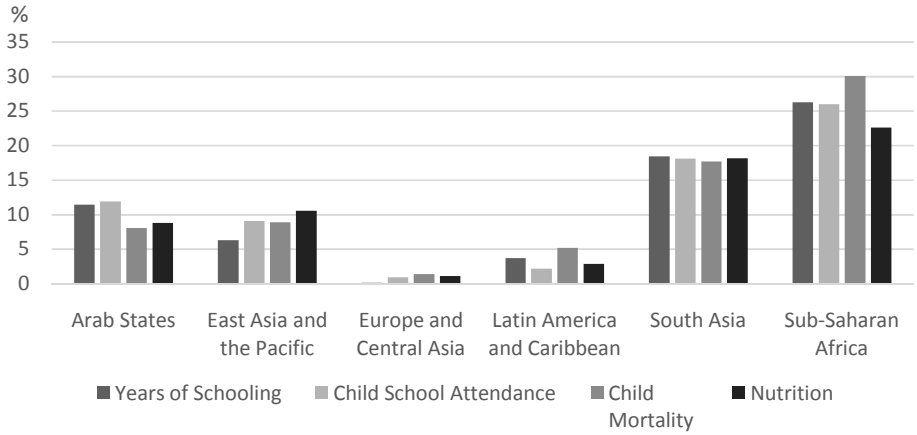
According to Figure 5, the region with the highest level of poverty in 2008 are Sub-Saharan Africa followed by South Asia and East Asia and Pacific by order. From 1990 to 2008, the region with the most impressive poverty alleviation in terms of the number of population under the poverty line was East Asia and Pacific. Regions that did not perform well in terms of poverty alleviation are Sub-Saharan Africa and South Asia. This is interesting because, based on the study of Mason (2005), East Asia, South East Asia and Pacific Islands are the regions that experienced the highest contribution of output per (effective) consumer from demographic dividend while Sub-Saharan Africa and South Asia experienced the least. Therefore, it is important to examine whether demographic transition especially in the aspect of human capital formation help alleviating poverty in these regions or not.

The second approach in measuring poverty is the direct approach. One important drawback of relying on income to measure poverty is that income is only a mean to an end. That is, what really matters for the standard of living for the poor is not the income they have but rather the consumption that they can achieve or the living conditions that they are experiencing. It is possible that even with a certain level of income (i.e. at the international poverty line), some important basic needs for human being such as having clean water or some access to electricity cannot be purchased.

In this paper, we rely on the Multidimensional Poverty Index (MPI) developed by the Oxford Poverty and Human Development Initiative (OPHI) and the United Nations. MPI is a direct measure of poverty which relies on multiple indicators of deprivation. The MPI is consisted of 10 components that capture household's deprivation in education, health, and standard of living. A score is given to each household in the survey and households that are deprived more than a pre-specified threshold is considered as being under extreme poverty.

For the purpose of this paper, we focus on the human capital aspect of MPI which are education and health. Four deprivation indicators from MPI that we focus are: i) school attainment ("no household member has completed at least six years of schooling"), ii) school attendance ("a school-age child (up to grade 8) is not attending school"), iii) nutrition ("a household member is malnourished"), and iv) child mortality ("a child has died in the household within the five years prior to the survey"). The first two indicators capture education aspect of human capital formation for the poor while the last two indicators capture health aspect of human capital formation for the poor. Figure 6 illustrates the four deprivation indicatorsfor selected region.

Figure 6: Raw headcounts (in percentage points)of people deprived in education and health components of the Multidimensional Poverty Index of selected regions (MPI 2015 update)



Source: Author constructed from Alkire and Robles (2015)

According to Figure 6, the region with the highest level of poverty according to the four deprivation indicates of MPI are Sub-Saharan Africa followed by South Asia. East Asia

and the Pacific have relatively lower level of poverty in education and health measures. This is consistent with the above direct measure of poverty that relies on income. Two limitations of MPI are the short time series of its data and the limited number of countries surveyed. However, this is the only poverty measure that has information on the human capital formation of the poor (i.e. education and health or the poor).

To examine the impact of demographic transition on poverty though human capital formation, we consider the following linear regression model:

$$Poverty_i = \alpha + \beta_1 GR\_FERT + \sum_j^J \beta_j X_j + \varepsilon; \quad (2)$$

where $Poverty_i$ represents our deprivation indicators from MPI (i = school attainment, school attendance, nutrition and child mortality), *GR_FERT* is fertility rate growth (obtained from the World Development Indicators), and X_j represents control variables which will be discussed below. It is important to note that equation (2) should not be affected by reverse causality. In particular, we assume there is no reverse causality from $Poverty_i$ to all right hand side variables. This assumption is plausible because all right hand side variables are aggregate measures which should not affected by deprivation indicators of the poor (i.e. the poor should have negligible impact on macroeconomic variables).

We considered five control variables. First, we control for the growth rate of real GDP per capita (*GR_GDP*). We control for the growth rate of real GDP per capita as faster economic growth (per capita) could enhance the standard living of the poor as well as influencing the fertility rate. Another reason that we control for the growth rate of real GDP per capita is to examine whether fertility reduction has independent influence on human capital formation of the poor beyond its effect though demographic dividend channel (i.e. demographic dividend leads to faster economic growth).

The second variable that we control is the level of MPI. Controlling for the level of MPI reflects the assumption that there is diminishing return in poverty reduction. In another words, it is easier to reduce poverty when poverty is high than when poverty is low. Roughly speaking, when poverty is high, many poverty alleviation programs or factors (e.g. demographic transition) are effective in reducing poverty. However, when poverty is low and concentrated (e.g. the poor are concentrated among the minorities), only poverty alleviation programs or factors that specifically targeting these people will be effective. Other “general purpose” programs or factors are less effective. Finally, three variables which represent the supply-side factors on human capital formation are incorporated: theshares of government expenditure on education in GDP (GOVEDU), the share of private expenditure on health in GDP (PRIV_HEALTH) and the share of public expenditure on health in GDP (PUB_HEALTH). The data for the control variables (except MPI) are from the World Development Indicators. The deprivation indicators from MPI has not been surveyed at the same year for all countries. However, it has been surveyed, roughly, around the same period

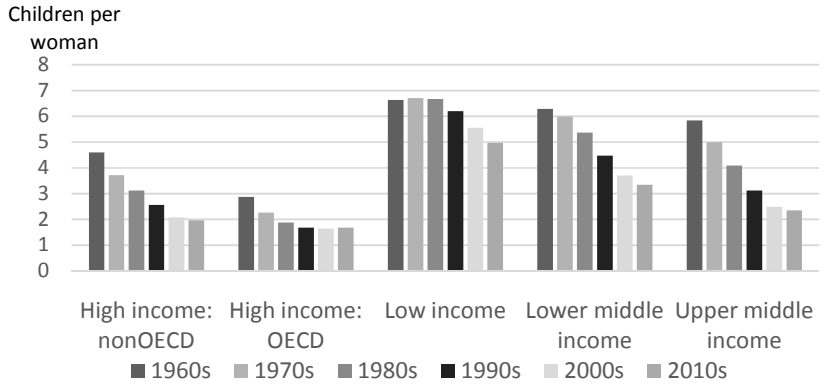
(in 2000s). All control variables use an average of annual values from 1995 to 2005. Next, we present our results.

IV. Results

In this section, we examine the impact of demographic transition on poverty alleviation through human capital formation. Reduction in fertility rate has been found to be beneficial to the *general public*. That is, it has been found to *shift the mean* of some important economic or social indicators. However, it is an empirical question to examine whether the benefit has been triggered down to poor or not (i.e. does it move the tail?).

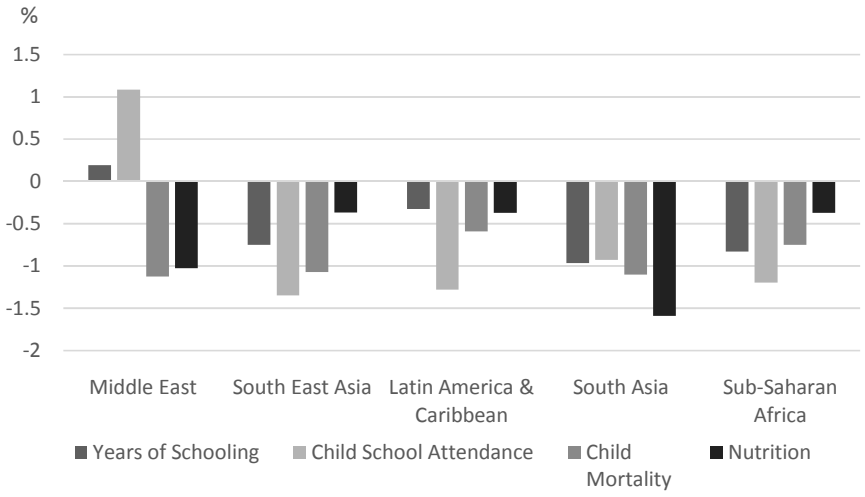
We begin by presenting basic information regarding our dependent variables and our focused independent variable. Figure 7 illustrates the change in the fertility rate of countries by income from 1960s to 2010s. Figure 8 illustrates annualized absolute change in raw headcounts of people deprived under each four deprivation indicators from MPI.As expected, low income countries have relatively higher fertility rate. Furthermore,reduction in the fertility rate for these countries has been relatively slower. This reflects the well-documented stylized fact about demographic transition that it started later for low income countries. The rate of fertility reduction seems to be more prominent among the upper middle income countries. For poverty alleviation reported in Figure 8, there seems to be large variation among the selected regions. South Asia seems to make the biggest progress in reducing deprivation in education and health. Among all indicators, South Asia is stand out in terms of improvement in the nutrition of the poor. South East Asia seems to progress well in reducing deprivation in education especially for school attendance.

Figure 7: Fertility rate of countries by income (children per woman)



Source: Author constructed from the World Development Indicators

Figure 8: Annualized absolute change (in 2000s) in raw headcounts (in percentage points)of people deprived under each four deprivation indicators from MPI (school attainment, school attendance, nutrition and child mortality)



Source: Author constructed from Alkire, Roche and Vaz (2014)

Tables 1 to 4 present our regression analysis on the impact of demographic transition on poverty alleviation though human capital formation. Tables 1 to 4 consider each of the four deprivation indicators in education and health from MPI as the dependent variable one at a time. Some notable results are as follows.

Column (1) of Tables 1 to 4 examines simple correlation between each of the four deprivation indicators and fertility growth. None of the deprivation indicators are correlated with fertility growth. However, in Column (2)of Tables 1 to 4, we control for the level of MPI (reflecting diminishing return in poverty reduction). Once the level of MPI is controlled, fertility growth is positively correlated with the change in school attainment deprivation. This implies that the bigger the fall in the fertility rate, the larger is the effect on reducing school attainment deprivation (t-stat = 2.00). In general, controlling for the level of MPI seems to make the estimates on fertility growth bigger (comparing Column (1) and Column (2)). However, for school attendance, nutrition and child mortality, the estimates are not statistically significant.

Columns (3) to (6) includes other control variables Columns (3) controls for the growth of GDP per capita (*GR_GDP*). There is some evidence that the growth of GDP per capita reduces school attainment deprivation and child mortality deprivation. Columns (4) to (6) includes shares of government expenditure on education in GDP (*GOVEDU*), share of private expenditure on health in GDP (*PRIV_HEALTH*) and share of public expenditure on health in GDP (*PUB_HEALTH*). None of these supply-side factors on human capital formation are not statistically significant. Thus, there is no evidence that these supply-side factor help reducing education and health deprivation among the poor.

Table 1: OLS regressions on annualized absolute change in raw headcounts (in percentage points)of people deprived in school attainment of MPI (independent variables are measured from 1995 to 2004)

	(1)	(2)	(3)	(4)	(5)	(6)
Independent variables	*School Attainment*	*School Attainment*	*School Attainment*	*School Attainment*	*School Attainment*	*School Attainment*
GR_FERT	0.76 t = 0.51	2.63** t = 2.00	2.51* t = 1.93	2.00 t = 1.39	2.11 t = 1.48	2.00 t = 1.36
MPI	-	-2.84*** t = -3.91	-2.83*** t = -3.97	-2.81*** t = -3.68	-3.01*** t = -3.88	-2.97*** t = -3.73
GR_GDP	-	-	-0.06 t = -1.44	-0.09 t = -1.79	-0.10** t = -2.02	-0.10** t = -2.01
GOVEDU	-	-	-	-0.004 t = -0.08	0.001 t = 0.03	-0.011 t = -0.18
PRIV_HEALTH	-	-	-	-	0.13 t = 1.19	0.13 t = 1.22
PUB_HEALTH	-	-	-	-	-	0.04 t = 0.39
R-square	0.01	0.33	0.37	0.39	0.42	0.42
Number Observations	34	34	34	31	31	31

Source: Authors constructed. Note: All regressions include an intercept term. ***, ** and * indicate 99, 95 and 90 percent of confidence level.

Table 2: OLS regressions on annualized absolute change in raw headcounts (in percentage points)of people deprived in school attendance of MPI (independent variables are measured from 1995 to 2004)

	(1)	(2)	(3)	(4)	(5)	(6)
Independent variables	*School Attendance*	*School Attendance*	*School Attendance*	*School Attendance*	*School Attendance*	*School Attendance*
GR_FERT	0.82 t = 0.28	2.17 t = 0.69	2.23 t = 0.70	2.00 t = 0.55	2.01 t = 0.54	2.49 t = 0.65
MPI	-	-2.05 t = -1.18	-2.05 t = -1.17	-2.13 t = -1.10	-2.16 t = -1.07	-2.34 t = -1.14
GR_GDP	-	-	0.02 t = 0.27	0.005 t = 0.03	0.002 t = 0.02	0.01 t = 0.08
GOVEDU	-	-	-	-0.03 t = -0.26	-0.03 t = -0.25	0.02 t = 0.15
PRIV_HEALTH	-	-	-	-	0.02 t = 0.07	-0.006 t = -0.02
PUB_HEALTH	-	-	-	-	-	-0.21 t = -0.67
R-square	0.002	0.04	0.04	0.04	0.04	0.06
Number Observations	34	34	34	31	31	31

Source: Authors constructed. Note: All regressions include an intercept term. ***, ** and * indicate 99, 95 and 90 percent of confidence level.

Table 3: OLS regressions on annualized absolute change in raw headcounts (in percentage points)of people deprived in nutrition of MPI (independent variables are measured from 1995 to 2004)

	(1)	(2)	(3)	(4)	(5)	(6)
Independent variables	*Nutrition*	*Nutrition*	*Nutrition*	*Nutrition*	*Nutrition*	*Nutrition*
GR_FERT	1.66 t = 0.74	1.91 t = 0.76	1.79 t = 0.70	1.67 t = 0.57	1.70 t = 0.56	1.75 t = 0.56
MPI	-	-0.32 t = -0.23	-0.31 t = -0.23	-0.36 t = -0.24	-0.34 t = -0.22	-0.36 t = -0.22
GR_GDP	-	-	-0.04 t = -0.60	-0.08 t = -0.88	-0.08 t = -0.81	-0.08 t = -0.79
GOVEDU	-	-	-	-0.008 t = -0.08	-0.10 t = -0.09	-0.005 t = -0.04
PRIV_HEALTH	-	-	-	-	-0.02 t = -0.12	-0.03 t = -0.13
PUB_HEALTH	-	-	-	-	-	-0.02 t = -0.09
R-square	0.01	0.02	0.03	0.05	0.05	0.05
Number Observations	30	30	30	27	27	27

Source: Authors constructed. Note: All regressions include an intercept term. ***, ** and * indicate 99, 95 and 90 percent of confidence level.

Table 4: OLS regressions on annualized absolute change in raw headcounts (in percentage points)of people deprived in child mortality of MPI (independent variables are measured from 1995 to 2004)

	(1)	(2)	(3)	(4)	(5)	(6)
Independent variables	*Child Mortality*	*Child Mortality*	*Child Mortality*	*Child Mortality*	*Child Mortality*	*Child Mortality*
GR_FERT	0.61 t = 0.37	1.46 t = 0.83	1.26 t = 0.74	1.24 t = 0.64	1.25 t = 0.63	0.91 t = 0.45
MPI	-	-1.28 t = -1.32	-1.27 t = -1.36	-1.20 t = -1.16	-1.21 t = -1.12	-1.08 t = -0.99
GR_GDP	-	-	-0.10* t = -1.82	-0.09 t = -1.33	-0.09 t = -1.28	-0.10 t = -1.36
GOVEDU	-	-	-	0.0003 t = 0.004	0.0006 t = 0.009	-0.04 t = -0.47
PRIV_HEALTH	-	-	-	-	0.007 t = 0.04	0.02 t = 0.17
PUB_HEALTH	-	-	-	-	-	0.15 t = 0.91
R-square	0.004	0.05	0.15	0.11	0.11	0.14
Number Observations	34	34	34	31	31	31

Source: Authors constructed. Note: All regressions include an intercept term. ***, ** and * indicate 99, 95 and 90 percent of confidence level.

V. Conclusion

Demographic transition can be beneficial to many people in the society. However, there is no guarantee that the same or any benefits will be triggered down to the poor. In this paper, we examine the impact of demographic transition on poverty alleviation through human capital formation. We rely on the data from the Multidimensional Poverty Index (MPI) for our human capital formation measures. We examine the impact of demographic transition on four deprivation indicators: i) school attainment ("no household member has completed at least six years of schooling"), ii) school attendance ("a school-age child (up to grade 8) is not attending school"), iii) nutrition ("a household member is malnourished"), and iv) child mortality ("a child has died in the household within the five years prior to the survey"). The first two indicators capture the education aspect of human capital formation for the poor while the last two indicators capture the health aspect of human capital formation for the poor.

We find that demographic transition help alleviate poverty in the dimension of school attainment. With lower fertility rate, poor household choose to invest more in education by going to school. However, we find no evidence that demographic transition help alleviate poverty in school attendance, nutrition and child mortality of the poor. We also find that economic growth (demographic dividend channel of demographic transition) help alleviate poverty in the dimension of school attainment. Furthermore, we also find evidence that economic growth help alleviate poverty in the dimension of child mortality. Interestingly, we find no evidence that spending on education and health help alleviate deprivation in education and health.

References

Ahmed, S., Cruz, M., Go, D. S., Maliszewska, M., & Osorio-Rodarte, I. (2014). How significant is Africa's demographic dividend for its future growth and poverty reduction?.*World Bank Policy Research Working Paper*, (7134).

Alkire, S. & Robles, G. (2015). Multidimensional Poverty Index 2015: Brief Methodological Note and Results. Oxford Poverty and Human Development Initiative, University of Oxford, Briefing 31.

Alkire, S., J. M. Roche & A. Vaz (2014). Multidimensional Poverty Dynamics: Methodology and Results for 34 countries. Oxford Poverty and Human Development Initiative, Oxford University. ophi.qeh.ox.ac.uk

Ashraf QuamrulH, Lester Ashley, &Weil David N. (2008). When does improving health raise GDP? In: Acemoglu Daron, Rogoff Kenneth, &Woodford Michael., editors. *NBER*

Macroeconomics Annual 2008.Vol. 23. Chicago, IL: University of Chicago Press; 2008. pp. 157-204.

Ashraf, Q. H., Lester, A., & Weil, D. N. (2008). *When does improving health raise GDP?* (No. w14449). National Bureau of Economic Research.

Barro Robert J. (1991). Economic growth in a cross section of countries.*Quarterly Journal of Economics*, 106(2):407-443.

Bloom David E., Canning David, Fink Günther,& Finlay Jocelyn E. (2009). Fertility, female labor force participation, and the demographic dividend. *Journal of Economic Growth*, 14(2):79-101.

Brander, J. A., &Dowrick, S. (1994). The role of fertility and population in economic growth. *Journal of Population Economics*, 7(1), 1-25.

Bloom, D. E. (2011). 7 billion and counting. *Science*, 333(6042), 562-569.

Bloom, D. E., Canning, D., Fink, G., & Finlay, J. E. (2009). Fertility, female labor force participation, and the demographic dividend. *Journal of Economic Growth*, *14*(2), 79-101.

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

Bloom, D. E., Canning, D., &Sevilla, J. (2004). The effect of health on economic growth: a production function approach. *World development*, 32(1), 1-13.

Cadar, D., Stephan, B., Jagger, C., Sharma, N., Dufouil, C., den Elzen, W. P.,& Johansson, B. (2015). Is education a demographic dividend? The role of cognitive reserve in dementia-related cognitive decline: a comparison of six longitudinal studies of ageing. *The Lancet*, 386, S25.

Chesnais, J. C. (1992). The demographic transition: Stages, patterns, and economic implications. *OUP Catalogue*.

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

Dyson, T. (2010). *Population and development: the demographic transition*. Zed Books.

Feyrer, J. (2007). Demographics and productivity. *The Review of Economics and Statistics*, 89(1), 100-109.

Feyrer, J. (2008). Aggregate evidence on the link between age structure and productivity. *Population and Development Review*, 34, 78-99.

Feyrer, J. (2011). The US productivity slowdown, the baby boom, and management quality. *Journal of Population Economics*, 24(1), 267-284.

Kögel, T. (2005). Youth dependency and total factor productivity. *Journal of Development Economics*, 76(1), 147-173.

Lee, R., & Mason, A. (2010). Some macroeconomic aspects of global population aging. *Demography*, 47(1), S151-S172.

Mankiw N Gregory, Romer David,& Weil David N. (1992). A contribution to the empirics of economic growth. *Quarterly Journal of Economics*, 107(2):407-437.

Mason, A. (2005). Demographic transition and demographic dividends in developed and developing countries. In *United Nations expert group meeting on social and economic implications of changing population age structures* (Vol. 31).

Mason, A., & Lee, R. (2006). Reform and support systems for the elderly in developing countries: capturing the second demographic dividend. *Genus*, 11-35.

Miller Grant. (2010). Contraception as development? New evidence from family planning in Colombia. *Economic Journal*, 120(545):709-736.

Modigliani, F. (1966). The life cycle hypothesis of saving, the demand for wealth and the supply of capital. *Social Research*, 160-217.

Rosenzweig Mark R,& Zhang Junsen. (2009). Do population control policies induce more human capital investment? Twins, birth weight and China's one-child policy. *Review of Economic Studies*, 76(3):1149-1174.

Schultz T Paul. (2009). How does family planning promote development? Evidence from a social experiment in Mat lab, Bangladesh, 1977-1996.*Mimeo*. Department of Economics Yale University.