Forecasting Educational Achievement Relative to Millennium Development Goals: Inadequacy of Financial Interventions in the Contexts of Under-capacity, Under-efficiency and Under-participation

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Thinking about the Future with the International Futures (IFs) Computer Simulation: Assorted Agendas
First Global International Studies Conference
Istanbul, August, 2005

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Abstract

A long-term education model developed within the broader global model of International Futures is used to explore the topics around the millennium development goal (MDG) of universal primary education– progress in the light of a historical perspective, the costs and the constraints. Different patterns of education system shortcomings characterized as under-capacity, under-efficiency and under-participation in this paper will prevent regions of Sub-Saharan Africa, South Asia or Arab states to reach the MDG target under the current conditions. These structural constraints make additional financing inadequate in meeting this MDG. The base case of the model as well as the increased domestic and international financing scenarios strengthen this skepticism by failing to take the most far-off of the regions sufficiently close to the target by the year 2015.

1. Introduction

At the UN millennium summit in September 2000, the leaders of the world adopted a set of global development objectives known collectively as the Millennium Development Goals (MDG). The second of the eight MDG is to achieve universal primary education (UPE) by the year 2015. This goal is a continuation of the Education for All (EFA) initiative declared at the 1990 World Conference on Education for All at Jomtien and a subsequent decade of increasing pledges and policy planning culminating in the establishment of a Framework of Action at the Dakar World Education Forum in 2000.

The declaration of the millennium summit expressed the need for a global compact in achieving the goals. The experiences of the past decades have resulted in recognition about the vicious cycle of underdevelopment and the need for integrated action with global support.

After the declaration of the MDG there has been significant attempts in finding out the modalities for achieving them. Most noteworthy among these attempts is the comprehensive goal by goal and overall implementation report from the UN Millennium Project (UNMP) led by Jeffrey Sachs. UNMP's task force on education and gender, led by Dr. Nancy Birdsall, published their final report early this year (2005). The expression of the global compact has, understandably, generated a greater interest in finding out the necessary costs required to reach the goals.

For the UPE goal, there have been rigorous costing exercises both at the global and country level. These costing exercises, despite their differences in the methodologies and the choices of indicator, all start with the assumption that the target of UPE will be achieved at the target and calculate the cost for that achievement. While it is important to know how much it will cost to have every children at the school, any analysis on UPE should ask at the first place whether it is achievable at all at the current rate of progress or at a normally accelerated rate achieved without any specific intervention in this sector.

This paper will seek answers to two sets of questions related to the UPE MDG. Firstly, where do the countries or regions stand in terms of achieving universal primary education by the year 2015? Could the low achievers reach the goal under existing access, coverage, completion and financing situations? Are there any structural constraints in the education system of the low achievers, which might prevent them from meeting the target in time? Secondly, what additional financing will be required to meet the target of UPE? How those costs can be financed domestically or internationally? And whether these additional financing is sufficient for achieving universal primary education?

The paper uses a three level (primary, secondary and tertiary) education system model being developed by the author for his Ph.D. dissertation with an objective to understand the costs and processes of production, accumulation and productivity of human capital in different regions and countries of the world. This model (referred in the paper as IFs Education Model or IEM) is developed inside International Futures (IFs), a global long-term futures model developed by Dr. Barry B. Hughes (Hughes, 1999). IEM runs within IFs borrowing from its demographic and economic modules and feeding back to them in some cases. This integrated formulation facilitates forecasting the evolution of the education system structure under multiple assumptions on resource mobilization.

2. Conceptual Understanding of Primary Education System

Primary education is the very first phase of formal education obtained by the children of any country before they can proceed to the next level of education. In UNESCO's seven level International Standard Classification of Education (ISCED 97), primary education is classified as level 1 (the 0^{th} level being pre-primary).

Children around the world start primary school at an entering age anywhere between five to seven, stay there for a duration ranging from three to seven years and graduate for the next level. The access and coverage in a primary education system is expressed by statistical indicators of intake and enrollment, which are the proportion of children entering and staying at the school respectively. In the ideal situation, the extent and efficiency of a national primary education system could be sufficiently expressed with a single rate each for intake, enrollment and graduation. In reality, however, kids might enter school at different ages and stay inside for a varying duration. In developing regions, parents are not always able to send their children to school at the appropriate age. Once in the school, not all of them progress through the system at the desired pace. Owing to various reasons including poverty of the families and the quality of the schooling system, children might repeat one or more grades or drop out of the school altogether.

To capture these realities, primary schooling statistics is reported as 'gross' and 'net' indicators. The gross (or apparent) intake rate is the number of students entering schools, irrespective of their age divided by the total number of entrance age children. In contrast, net intake rate is the entrance age entrants divided by the entrance age children. Similarly, there are gross and net enrollment ratios for the whole span of primary education. Gross enrollment ratio is the total number of children in the primary schools irrespective of their age divided by the population of primary school age kids, whereas net enrollment is the number of school age enrollees divided by the population of that age. Though the denominators in are the same in both cases the numerators differ and are always higher (or equal) in the case of gross. Both gross and net statistics are expressed in percentages and, by definition, the gross enrollment can go above 100 percent. UNESCO maintains the most comprehensive database on the gross and net enrollments and indicators compiled (or estimated in few cases) annually (UNESCO, 2004) with data from the education ministries of national governments.

In addition to enrollment and intake, there are official data on the percentages of repeaters and dropouts. However, the usual approach is to lump them into a single indicator titled survival (or persistence) rate, which is the percentage of a first grade cohort who reach the final grade. Survival, expresses as a percentage should always be less than (or equal to) 100 percent and is viewed by many as an indicator of system efficiency or even as a proxy for learner's quality.

Differences in the enrollment, intake and survival as well as the differences within the net and gross of the first two of them, help us understand the structure of the education system in a particular country at any particular point in time. The three distinct structural patterns (under-capacity, under-efficiency and under-participation) will also be conceptualized in terms of these indicators.

There are small differences among the experts on the choice of the target indicator for universal primary education goal. United nations' Statistical Division has listed net primary enrollment as the prime indicator with the target of 100 percent net enrollment by 2015. There is some opposition to this indicator raised by the phrase 'universal primary completion' in the articulation of the MDG and the fact that not everybody in school in 2015 will necessarily be completing the course. Accordingly, a (gross) completion rate is adopted by some (e.g., WB 2003) as the indicator of choice and the target of 100% completion is added with an implicit (and even closer) stepping stone of 100 percent of net intake by the year 2010. A careful analyses of the structural patterns in primary education systems taken up later in this paper shows that high achievements in net enrollments simultaneously lead to high survival and consequently high completion. It is the gross enrollment, which can mislead when chosen as an indicator, because of the low survival in underdeveloped countries that might result in low net enrollment even with a 100% gross enrollment and intake.

3. Literature Review

Integration of the primary education goal in the set of the MDG in September 2000 is the continuation of a decade of renewed global emphasis in this area starting from the 1990 World Conference on Education for All (EFA) at Jomtien. Since Jomtien, there has been a substantial

amount of literature (for example Colclough and Lewein 1993) focusing mainly on the benefits of and strategies for achieving EFA. There has been no mentionable attempts in the nineties (at least not any that the author knows of) to come up with detailed costs at global, regional or country level for achieving the goal of EFA. The concerted commitment of the donors at the millennium summit and the realization of the limitations of developing economies in achieving the EFA all by themselves, have shifted the attention in the literature more towards the feasibility and the cost of reaching the goal. There have been two visible strands in the literature. A growing body of literature developed during the past five years focus on the obstacles in achieving the universal primary education. These papers and reports, quintessential amongst which is final report of the UN Millennium Project's taskforce on education and gender inequality (UNMP, 2005) contrast the education systems of the non-achievers with those of the achievers to identify the structural constraints, if any. A second body of literature has done rigorous calculations of the costs of achieving universal primary education by 2015. These costing exercises, sponsored justifiably by major international development organizations, have a general characteristic of doing a backward calculation in the sense of interpolating the target indicator to the desired level at the end of horizon and determining the cost to support that interpolation. The level of demographic, economic, budgetary and international political detail presented in some of these spreadsheet models should help estimate the required level of domestic or international resource allocation. These models, however, do not address the possibility of missing the deadline in the context of structural impediments present in the system.

3.1 Review of Structural Analyses

Studies taken up by the experts at international development organizations and policy NGOs have discovered historical patterns of high and low achievements in primary education in different parts of the world. In general, the developed economies (OECD countries) are all at or near 100 percent net enrollment by now. In fact, the world when looked as a whole doesn't look very far from the goal. However, on a more disaggregated canvas, regions of Sub-Saharan Africa, South Asia and Arab states stand out as the ones most far away from the goal.

UNDP's human development report for the year 2003 (UNDP, 2003) carried out a region and country-wise analyses of the MDG target indicators. The summary findings of that report on the primary education goals can be obtained from the following graphics (fig 3.1) adopted from page 52 of the second chapter of that report:

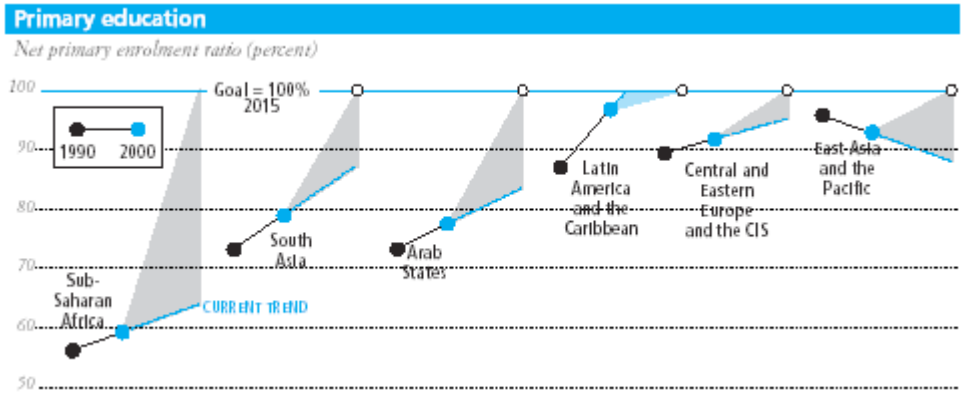

Fig 3.1 Progress towards the Millennium Development Goal (Adopted from UNDP Human Development Report 2003).

Five of the six regions shown in the above graphics need to do better (much better in the three cases of Sub-Saharan Africa, South Asia and the Arab states) than how they did in the last ten years to be able to reach the goal in the next ten years. The worst case is Sub-Saharan Africa (SSA) where the situation is a stagnation rather than progress with little more than half (57%) of all children going to primary school and only one in three children finishing the same. South Asia (SA) is identified as another high priority with about one fifth of its children out of school. Though the magnitude of progress made by these two regions (SSA and SA) in the nineties looks close, SA has definitely done much better in terms of headcounts considering the large population of countries in this region. The much rich Arab states, on the other hand, are going in parallel with South Asia, with a projected risk of falling even behind. This report also identifies the high achievers in recent years and their 'best' practices with a suggestion to export them in the low achievers.

Clemens (2004) in a paper done for the UNMP task force on education, draws an interesting comparison between the progression of primary education indicators in currently underdeveloped economies with those of the now developed countries during their early years of development. According to his findings, the present transition rates in primary enrollment in countries as away from the goal as the Sub-Saharan country of Burkina Faso are impressive when compared to those in Japan or the United States during the second half of the nineteenth century. Clemens considers the education MDGs a little too optimistic ('utopian') considering the long time horizon needed to bring positive changes in school enrollment. He also points out the need for an integrated development approach and cautions against exporting the 'best' practices of high enrollment growth without a careful scrutiny between the quality quantity trade-offs.

UNESCO has recently published its EFA Global Monitoring Repot 2005 themed on the quality of the education. EFA is a set of six goals in the areas of coverage, equality and quality of primary and pre-primary education. This report has supported the findings of the human development report in terms of at risk regions. The report highlights the worsening of gender parity in primary education in the Arab region. Girls form sixty percent of the total out of school children in that region compared to the global average of fifty seven percent.

UN Millennium Project's task force on education and gender inequality identifies the current problem regions based on the performance during the fourteen years from 1990 to 2002. Despite the description of the sorry situation of the primary education in the regions of Sub-Saharan Africa, South Asia and the Middle East and North Africa, the task force report suggests to broaden the target by pointing out the need for strengthening the opportunity for post-primary education to reinforce demand at the primary level. The task force also identifies the demand and supply constraints and the institutional shortcomings and suggests strategies to overcome those.

3.2 Review of Budgetary Analyses

The costing literature has the general characteristic of finding out an annual per student cost and multiplying that with the number of primary students that needs to be in the school each year to take the net enrollment (or the target indicator) gradually up to a 100% by the year 2015. Demographic and economic projections are used to a varying degree in these calculations.

UNESCO country data on enrollment ratios and per student public expenditures, published on an annual basis, are used as base data. At least one of these analyses attempts to find out the gap in financing under different scenarios of resource mobilization.

In an UNICEF study, Delamonica et. al (2001) did a country-by-country calculation of the average additional amount that will have to be spent every year to achieve universal primary education. Their estimates are based on the most recent country-by-country data on budgetary expenditure, population and enrolment trends, and unit cost at the primary level. According to their findings, the annual additional cost of achieving 'education for all' in developing countries by 2015 is estimated at $9.1 billion (expressed in dollars of 1998). This represents less than one-third of one-tenth of one per cent of world GNP (0.03 per cent) and 0.14 per cent of the combined GNP of developing countries. The global shortfall represents about 11 per cent of what developing countries currently spend on primary education. According to their paper, 'education for all' is affordable at the global level. This calculation is based on an average unit cost applied over a linear projection of net enrollment. As this paper will show, the at risk regions will go through a period of substantially higher than 100% gross enrollment before they can reach the target of 100% net enrollment and 100% completion, because of a common structural characteristic of low survival in these education systems. There assumptions about the mutual compensation of the gains from increased system efficiency and the loss from increased unit cost at the margin is too optimistic to hold true within the short timeframe of ten years left to reach the goal.

In a UNESCO study, Brossard and Gacougnolle (2001) estimated the cost of achieving Universal Primary Education by 2015 for the developing world as a whole. They started with net enrollment rate and used an ‘inflation factor’ (inverse of net) to calculate gross enrollment. This gross enrollment rate was multiplied by population projection to get total number of students. They used pupil teacher ratio and converted per student recurrent expenditure to per teaher expenditure. They also calculated a capital cost as a percentage of recurrent cost. They then developed different scenarios by changing or maintaining the pupil teacher ratio. According to their estimate the cost of UPC by 2015 the annual cost will be $125 billion to $133 billion, which is $26 billion to $34 billion higher than the 1997 primary education spending of $99 billion. This study does not incorporate any growth in unit cost, e.g., increased salary of teachers.

There have been two major calculations of the primary education MDG cost done at the World Bank. The initial one, done in an aggregate fashion by Devrajan et. al. (2002) estimated the additional number of kids those need to go to school between now and 2015 to achieve 100% enrollment by that time. The projection on the number of kids was then multiplied by different types of unit costs, e.g. average cost or median regional cost or a target cost of 13% of GDP per capita. Using these methods, they have come up with a figure of $10 to 15 billion of overall additional spending per year for all countries to reach the goal. There estimate jumps to $27 billion for the scenario in which per student spending is targeted to a proportion of per capita income. This calculation did not account for any changes in demography and thus raises the possibility of an underestimation of the costs considering the comparatively higher population growth in the at risk regions. On the other hand, the scenario for the best practice unit cost might have resulted in an over estimation in the absence of any positive feedback from higher spending and even a possible negative feedback for the East Asian and Latin American regions with already high achievement

A more recent estimate at the World Bank was done by a team led by Barbara Bruns and Alain Mingat (Bruns et. al, 2003). The objective of this estimate was to estimate the domestic financing gap, which is slightly difference from the calculation of additional costs performed by other studies. They followed a bottom-up approach to calculate the cost for 47 low achiever countries for which they had reasonably high quality data. They developed a spreadsheet model to sum up the recurrent cost from the two different components of non-teacher and teacher salary costs. They have also calculated a capital cost required to build new classrooms for the projected additional enrollments. They have incorporated demographic projection from UN Population Division projections and a constant 5% economic growth in their model. They also did the costing under different scenarios of quality and efficiency improvement and a larger domestic resource mobilization and allocation, towards a benchmark established from high achieving systems. Unlike other models Bruns et. al used completion ratio as an indicator of MDG target, not net enrollment. According to this study, the total cost for 47 countries starting in the year 2000 and achieving the MDG in 2015, under different scenarios ranges roughly between 200 to 250 billions of constant US dollars, with a financing gap ranging from $ 40 billion to $ 30 billion over the entire period. Thus, the donors need to pledge an average of about $2 billion to $2.5 billion per year for these 47 countries to steer them to the goal. This analyses, despite being the most comprehensive one with the consideration of disaggregated components of cost and the regional dissimilarities on the cost structure, exclude the possibility of missing the goal under structural constraints present in the existing education systems. The costs obtained in this study are not directly comparable to results from previously mentioned estimates because of the differences in the sample size and the achievement and the cost variables.

3.2 Summary of the Review

The above body of literature has a definitive value in devising any policy and action towards universal primary education. They identify the high priority regions, high achiever practices and the costs of exporting those practices to the problem regions with an on time journey to the target. These analyses however fall short of an structural analyses of the patterns of under achievement and the consequent possibility of an incomplete journey to the goal even at a raised fare. This paper attempts to take up an integrated analysis to find out the structural constraints in the primary education systems of the stragglers and to examine the effectiveness of financing recommendations with the help of a simulation model with linking the education system to demography, income and spending at the household and national level.

4. Methodology

This section provides a simplified overview of the IFs education model used for the analyses presented in this paper. The model is a computer simulation running in annual time steps carried over to the subsequent year. In addition to the calibration from historical data the model has specific algorithms representing the flows within the education systems. The details of the model algorithm can be found in the help system of the International Futures available at http://www.du.edu/~bhughes/WebHelpIFs/ifshelp.htm

IFs education model has a representation of the education systems of 182 countries with a detailed structure for the flows of gender-identified pupils through the major stages of formal education starting at the primary. The underlying demographics (e.g., projection of school age children) and economics (e.g., economic growth and the public finances allocated for education) are supplied by the IFs population and economic modules. At present there is minimal feedback from education to economic productivity with a future plan of more specific linkages. Following block diagram (fig. 4.1) represents the two major components of the education model and their linkages with the relevant modules of IFs.

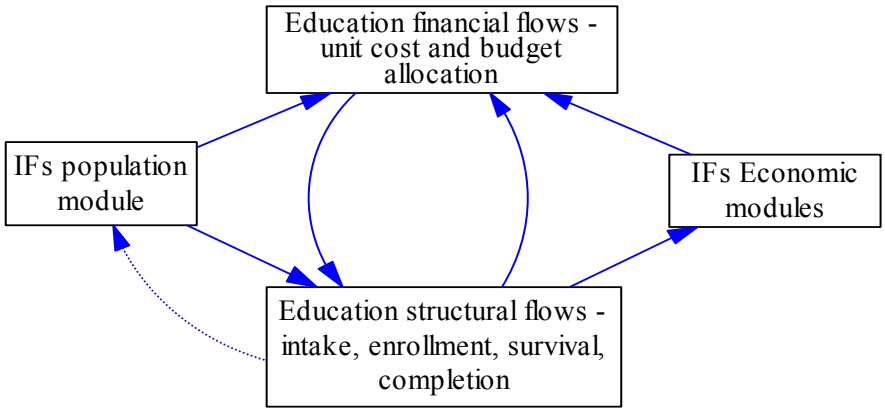

Fig 4.1 Block diagram of IFs education model

To maintain the relevance to this paper we shall describe only the primary level of the education system structure. Number of students entering the first grade of primary in each country are determined with a gendered gross intake rate, obtained from the UNESCO data, applied to the number of children of corresponding age determined by the IFs population module. The student flows inside the five grades of the primary schools is represented in the following diagram (fig. 4.2). Students either proceed to the next grade or dropout of the system. An average drop out rate meant to contain the effects of both dropout and grade repetition is calculated from the survival rate. The intake rates used in the model are the gross intake rates and the enrollment ratios obtained initially are gross enrollment rates. The gross enrollment rate is used to calculate a net enrollment ratio using a cross-sectional function estimated from UNESCO data. One of the current limitations of this structure is an equal duration of the primary education across board. But given the objective of calculating enrollment ratios rather than absolute numbers and the fact that the lower and higher durations within the same region compensate for discrepancies in the regional aggregates on costing , not much precision is lost by this simplistic assumption. Moreover, the grade-wise structure of the model will make the future inclusion of duration less difficult.

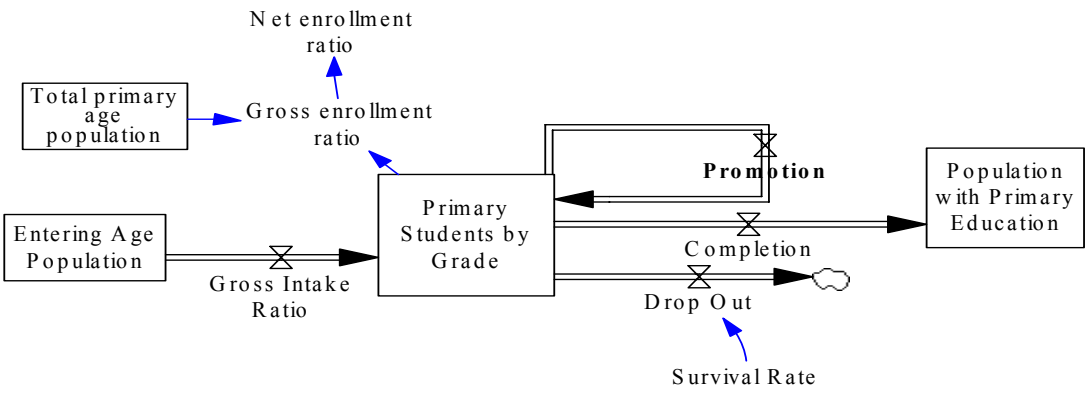

Fig 4.2 Education systems in the IFs education model

The key dynamics of the student flow lie in the gross intake ratio and the survival rate. These rates equalized to the historical data at the base year of 2000, are influenced in the subsequent years by two of the IFs economic variables at the corresponding years, gross domestic product (GDP) per capita and the government expenditure on education. The first one works as a proxy for the current level of economic growth influencing the supply side as well as the level of parental income on the demand side. The government expenditure, which is itself driven by the total GDP, represents the allocation in education alongside other public expenditure priorities like health or defense. The education model reallocates the educational expenditure into different levels of education proportionate to the demand in each level as determined by the per student cost and the total enrollments at each level. The per student cost is determined as a proportion of per capita income using a cross-sectional function estimated from the data.
of each level and the outputs are the graduates and students by level. The logic of the budgetary flows and their outcomes are presented in the figure below (fig. 4.3). On the demand side, increased income of parents will result in a higher percentage of them sending their children to school. On the supply side, higher spending will help recruit more students and less of them dropping out or repeating in the course. The current version of the model includes only the current expenditures in education, which is adequate for this analyses. The model however has necessary elements in place for future incorporation of capital expenditure, if needed.

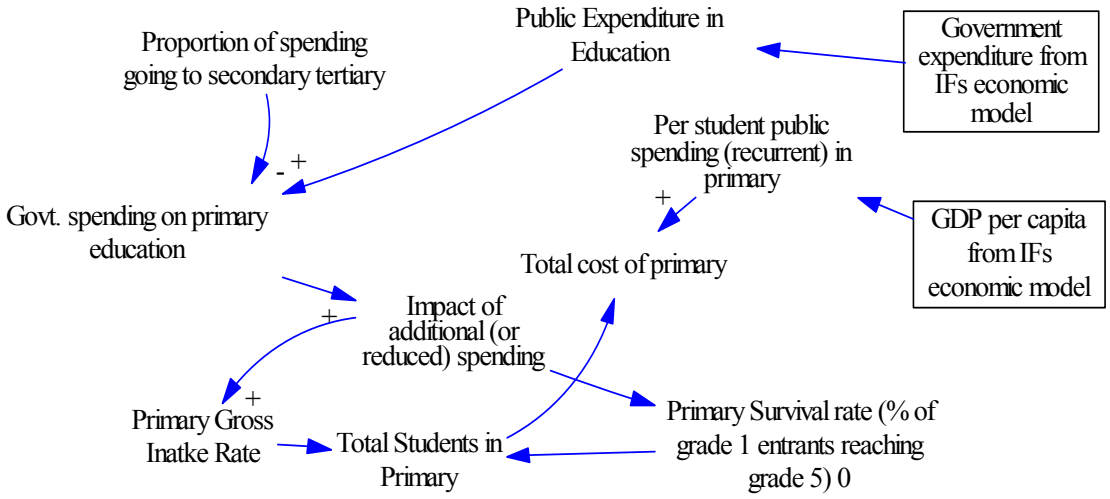

Fig 4.3 Financing of the education systems in the IFs education model

The model starts at the year 2000 and has the capability of forecasting the base case as well as alternate futures with different mixes of resource mobilization and budget allocation using a host of scenario drivers. A historical education system database, going as far back as 1970, compiled from the official publications of the UNESCO and the World Bank is used to calibrate the model. The incorporation of the database within the model software facilitates the analysis of historical trends and juxtaposes them with the forecasts under alternate scenarios.

5. Results

Analyses using the historical database compiled within the education model have found three distinct types of low net enrollment primary education systems:

a. **Under-capacity systems**: These are systems with low gross intake, low gross enrollment and low survival.
b. **Under-efficiency systems**: These are systems with relatively higher gross intake and enrollment but a low survival.
c. **Under-participation systems**: These systems have high survival rates but an uncomfortably low net enrollment rate possibly because of lower intakes.

The following parts of this section will elaborate this typology using historical examples. The paper then use the IFs base case forecast to point out the likelihood of missing the millennium goal on primary education as a consequence of these structural impediments. A couple of scenarios presented at the end of the section strengthens this finding by forecasting a gap from the target in the most at risk region of Sub-Saharan Africa even after increased resource mobilization and allocation.

5.1 Elaboration on the Structural Constraints of Under-Capacity, Under-efficiency and under-participation

The primary education related MDG is phrased as follows: "The target Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling." Though the target clearly calls for a total completion, the most frequently used indicator used for this MDG target is the net primary enrollment ratio. The setting of net enrollment as the indicator of choice might be a result of the constraints in the data collection and the assumption that a regularization in student flows ultimately regularizes the graduation. I would like to reiterate once more the differences in definition and dissimilarities in pattern between the gross and net enrollment ratios in developing countries. Because of these discrepancies in different types of enrollment data other indicators are also sought. The study done at the World Bank (Bruns, B. et. al 2003), has used completion as the indicator for MDG. According to their definition, they used a gross rather than net completion rate, rejecting to use any of those prefix though. Whatever be the choice of indicator for target MDG, the primary intake rate has to reach hundred percent sufficiently ahead of time to reach universal primary education by 2015.

IFs education model is a structural model calculating the grade-by-grade flows of girl or boy students. IEM thus has the privilege of being able to follow through all the gross and net rates. Using IEM's trend analysis capability under achievement countries are classified into three groups of under-capacity, under-efficiency and under-participation defined above.

Under-capacity systems are those with low intake and enrollments accompanied with low survival. These countries are lacking both in participation and in efficiency. Here is an example with gross intake(EDPRIINT), gross enrollment (EDPRIENRG), survival (EDPRISUR) and net enrollment (EDPRIENRN) data for Burkina Faso :

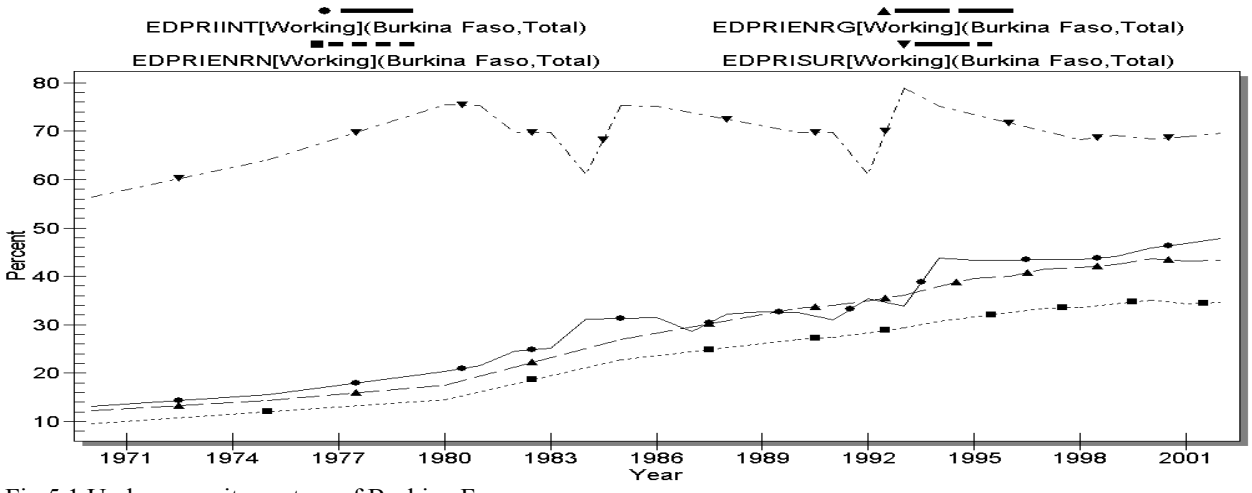

Fig 5.1 Under-capacity system of Burkina Faso

As evident in the above figure (fig. 5.1), the net enrollments of these under capacity countries are as low as their gross enrollment. These countries need to expand the access as well as the efficiency to reach the target of universal education. Most of the Sub-Saharan African countries can be characterized as under capacity countries.

Under-efficient systems have higher gross intake and enrollment ratios. A closer examination of these countries' (e.g., India shown in fig. 5.2) enrollment patterns reveals that their net enrollment is still far from the cent percent goals. However, the gross enrollment ratios (and the

gross intake rates) in these countries are close to (or in some cases higher than) one hundred percent because of a large number of grade repeaters and late entrants. India will be an example of such a country, as shown below:

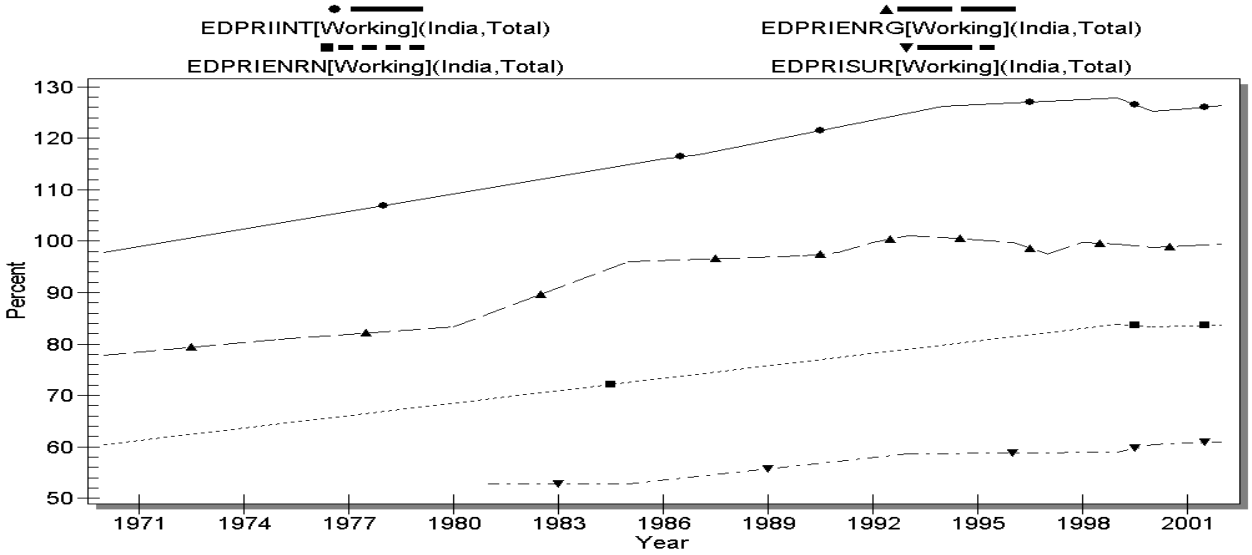

Fig 5.2 Under-efficiency system of India

These under efficient systems most likely represent one or more of the following situations:

a. Supply-side pushes during the last few decades have succeeded in building enough schoolrooms. However, the demand for schooling hasn't gone up as much because of the poverty or the perception of the families.
b. The efficiency of the school systems did not get equal emphasis in policy making in the past years

The near hundred percent gross enrollment rates in the under efficient countries might convey an initial impression of solving the problem of access already. However, a close inspection of pupil teacher ratios (PTR) in some of these countries (e.g., Bangladesh with a PTR of 55) will reveal an over-crowdedness in these systems, which might well be the cause of under efficiency. Countries in the South Asia generally fall into the category of under-efficient countries. Countries in the South Asia generally fall into the category of under-efficient countries.

A third pattern, which is labeled as under-participation, is observed especially among some of the Arab countries. Saudi Arabia (fig. 5.3) can be considered an example. Despite a historically high survival rate, the enrollment and intake rates in this country remain low. This high persistence added with the simultaneous progression of gross enrollment and intake rates with a somewhat lower net enrollment tell us several things: a certain proportion of children, coming either from the less advantaged of the two genders or the low income families, never have the chance to attend school, those who have the privilege to attend school cannot be failed though some of them might start later. This under-participation might in reality be an under-reported participation with national or international decisions to exclude the religion based education system from the formal education statistics (this assumption is not verified for this paper).

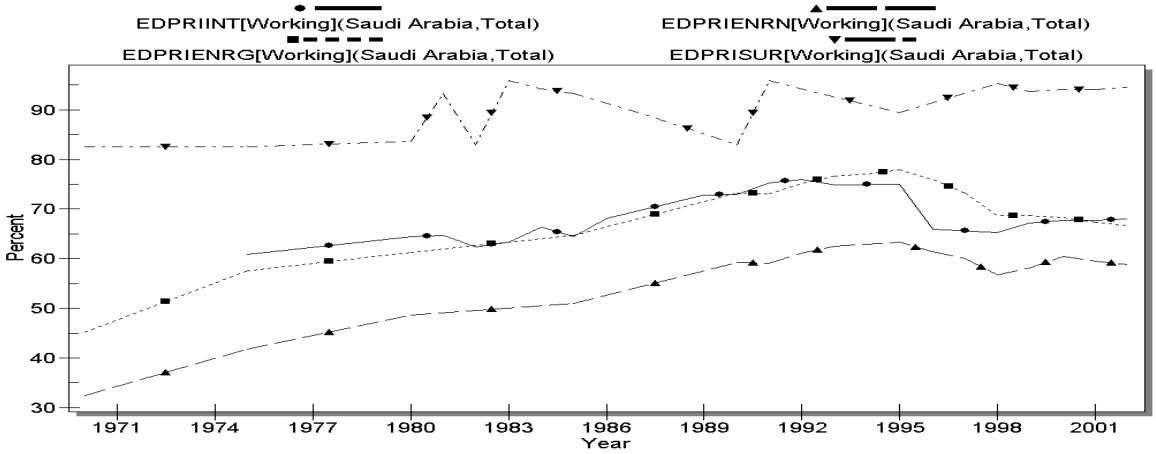

Fig 5.3 Under-participation system of Saudi Arabia

5.2 Contrasting the base case forecast with historical patterns

According to the UN Millennium Project Task Force report on education (2005), there have been improvements in global and regional primary school indicators. Available data, however, prove otherwise in the global case. The following graph shows a continued pattern of under capacity and under efficiency in non-OECD countries as seen from population-weighted aggregations on five major primary education indicators (gross intake, gross enrollment, net enrollment, survival to the last grade).

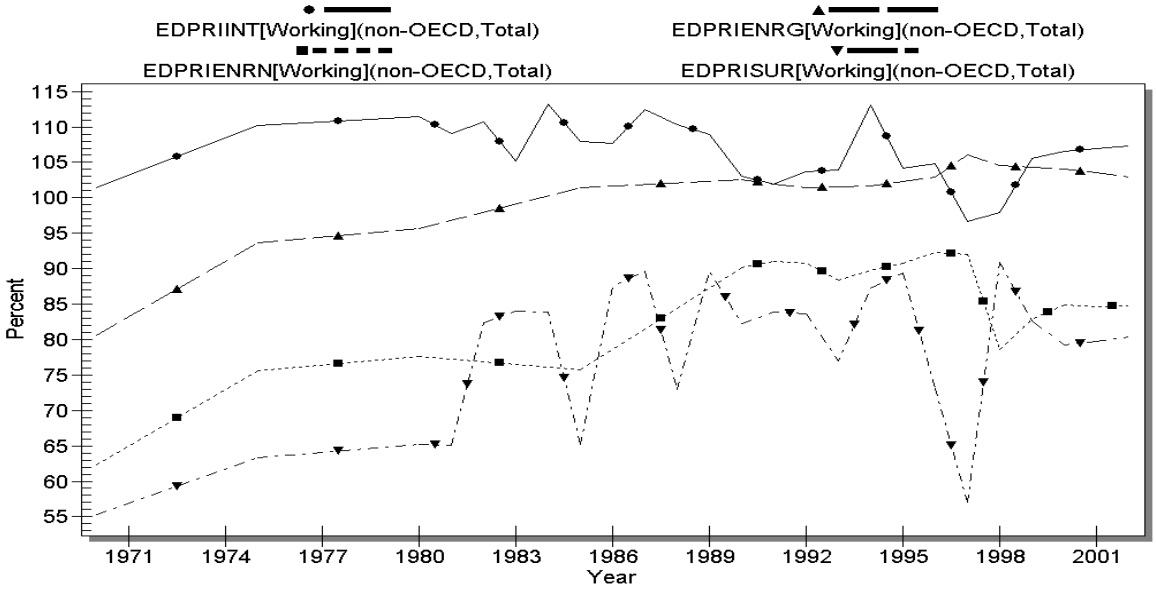

Fig 5.4 Historical progress of the non-OECD group

A disaggregated view however reveals differing patterns among regions. Here we shall analyze the historical trends alongside the base forecast for six regions especially identified in the UNDP human development report (2003). Then we shall summarize the base case future by presenting an overall forecast for all non-OECD countries.

The most off track region identified by the UNDP is the Sub-Saharan Africa (fig. 5.5). Here, as indicated above, systems are both under capacity and under-efficient historically. An extension of these history, without any specific intervention shows little improvement by 2015. The goal is sure to be missed for Sub-Saharan Africa in the absence of drastic actions.

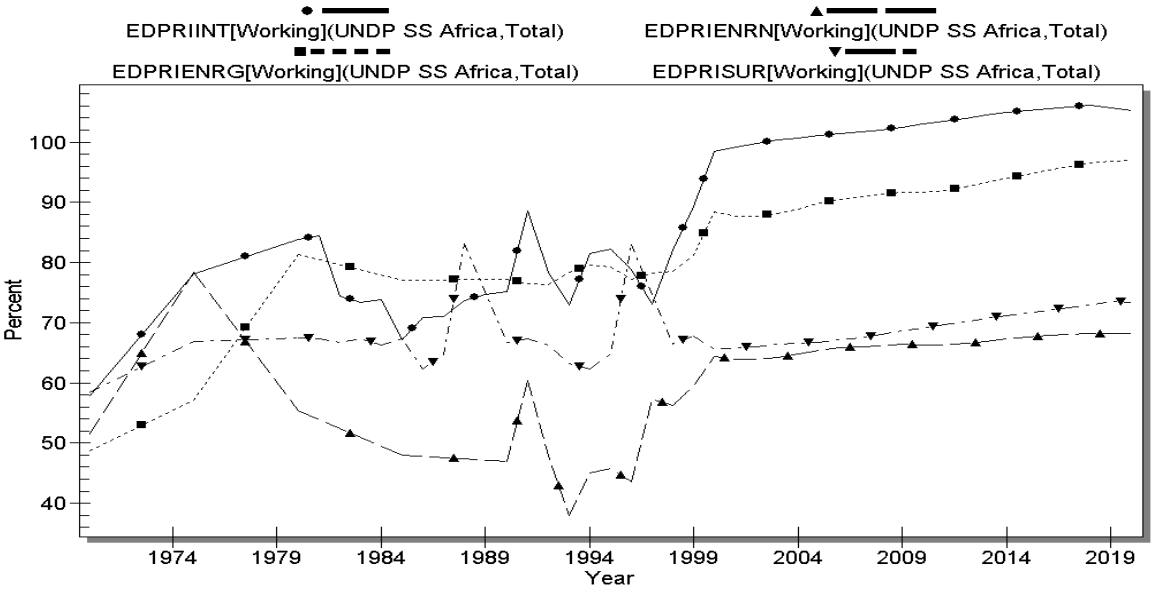

Fig 5.5 Historical trends in the Sub-Saharan African group

South Asia (fig. 5.6), on the other hand, is a region with under efficiency but not under capacity at the face (at least at the current ratios of teachers to students). Despite the increases in gross intakes, low persistence within the system held the region from achieving net high enrollment by 2015. Interestingly, gross enrollment keeps on soaring within this period, presumably increasing the burden on already overcrowded systems like that of Bangladesh. These countries should have to be careful while increasing school spaces for projected enrollment increasing. While 100% gross enrollment indicates the adequacy of classrooms required for the MDG target, they might have to build more school spaces because of the need to accommodate a substantially higher than 100% gross enrollment in the interim period and to increase the quality of the system by lowering the number of pupils per teacher, which would eventually pay off by increasing persistence.

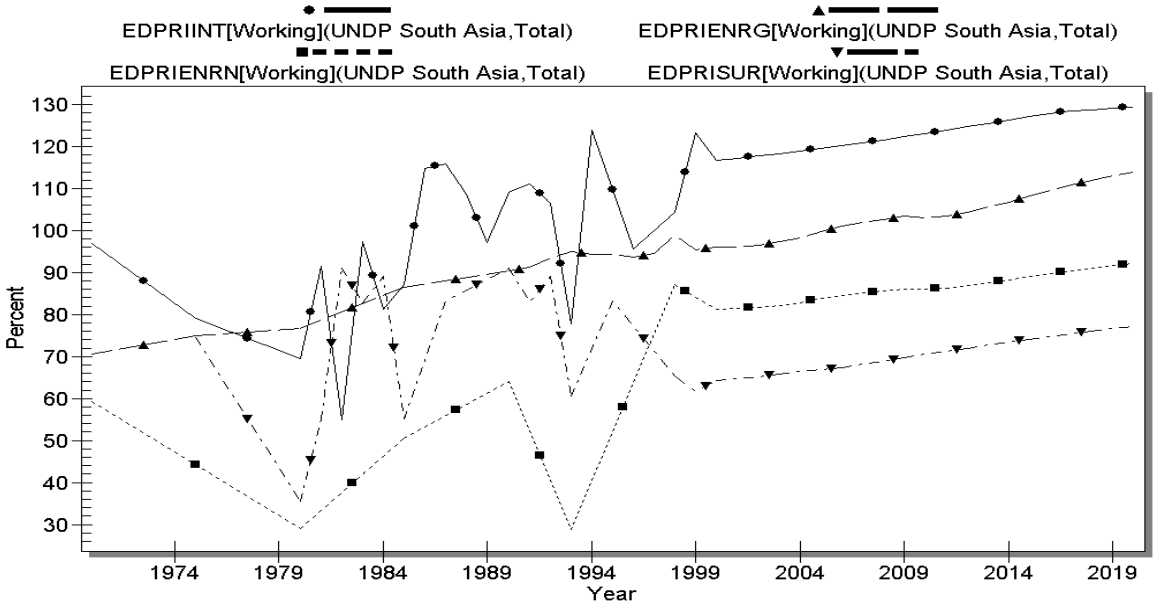

Fig 5.6 Historical trends in the South Asia region

Arab region (UNDP Arab states, fig. 5.7) shows a yet different pattern, which we have called under participation. In this region, gross and net enrollments both advanced for last three decades. A period of high gap between the two has passed in the late eighties and early nineties. Gross enrollment, however, never crossed one hundred and the net enrollment ratio eventually caught up with the gross with a reasonably high (but not perfect) persistence rate. The cause the gross enrollment never goes above one hundred (despite lower persistence in the earlier years) might be a low number of repeaters. This is supported by UNESCO (2004) data that shows a single digit repeater percentage for almost all Arab countries. The base case forecast for this region puts them much below the one hundred percent net enrollment rate by the year 2015.

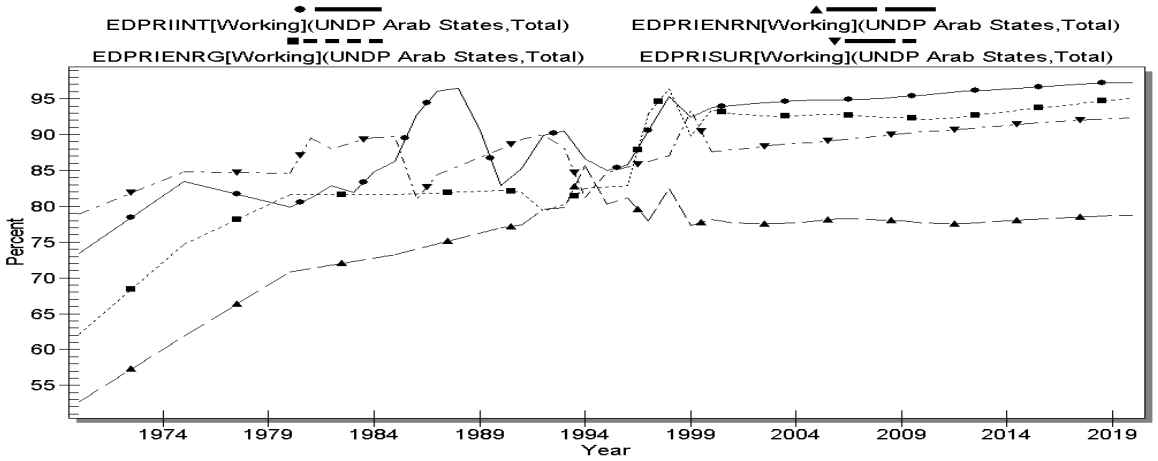

Fig 5.7 Historical trends in the Arab States

The situation is not as bad for the remaining three of the UNDP regions (fig. 5.8). East Asia and the Pacific region have achieved an impressive 95% net enrollment. This ratio is nearly equal to that of the OECD countries (the UNDP region does not include South Korea). This region,

however, includes China, where, a one percent increase in enrollment might mean putting millions of kids to school. The enrollments in the Latin America and the Caribbean has also increased gradually to a point, where it should not have been difficult for the countries in this region to achieve universal coverage by 2015. According to the base case forecast of IFs education model, both of these regions (Latin America-Caribbean and East Asia-Pacific) shall reach close to 95% net enrollment by 2015, which is practically proximate to the universal coverage. The percentages of children enrolled in the East European and CIS countries, which had a high record historically on all education indicators, have dwindled after the opening of their economies. Be it a real adjustment of demands to supplies or a reality revived on ideologically inflated numbers, the more recent statistics would be able to tell whether this region might be able to reach the goal without much attention (as shown in our base case) or needs some intervention.

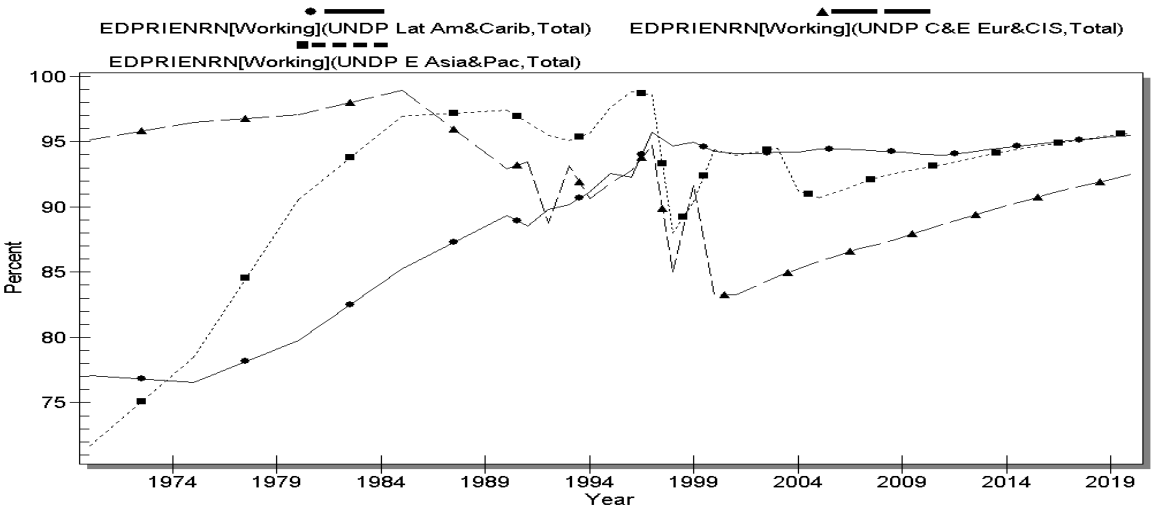

Fig 5.8 Historical trends in the Latin America and the Caribbean, Central and Easter Europe and the CIS and East Asia and the Pacific

At a global level, in the base case, the non-OECD countries will be off of the one hundred percent enrollment target by about thirteen percent in the year 2015. This group, however, contains the middle-income high achievers in Latin America and the emerging economies of East Asia.

5.3 Scenarios

Major scenario analyses done on the achievement of primary education MDG incorporate costing exercises under different assumptions of financing and quality improvement. These analyses without highlighting much on the practicality of the goal under historical conditions of progress calculate the current and capital expenditures required to put (or pass) one hundred percent of the children to school by the year 2015. One exception to this line of analyses is the one done by Clemens (2004), where it is shown that even the laggard countries of today have enrollment progression rates comparable to or better than those of now developed economies during their period of transition. Clemens' findings cast some shadow on the achievability of the primary education MDG even with coordinated domestic and foreign interventions.

In the sections above, I have shown the improbability of achieving the primary education MDG under business as usual. With the IFs education model, I have built a set of scenarios to identify some useful policy interventions in achieving the goal. The scenarios are run over a time horizon of twenty years starting at the year 2000. The scenarios are driven by regional or global changes. The scenarios attempt to explore :

a. the outcome of additional financing on education in general and primary education in particular
b. trade-off between additional educational spending and other public financing sectors
c. the potential sources of additional financing, domestic versus international
d. impact of convergence of unit cost to a global standard

Tabular summary of scenario specification

No	Scenario Name	Description	Group/Region	Horizon
1	HESNO	High Education Spending Non-OECD Countries	Non-OECD	2020
2a	SSA Rev	High spending on education; High Spending on Primary Education; High Revenue	SSA	2020
2b	2b SSA RevAid	High spending on education; High Spending on Primary Education; High Revenue; High Aid from OECD; High Aid Receipt by SSA	SSA	2020

5.3.1 Scenario 1: High Education Spending Non-OECD Countries (HESNO)

Despite the debate on the effectiveness of spending without substantial quality improvement scenarios, it is the variable with most direct connection with achievement at least in the initial steps towards the target. As a very first intervention, the educational spending of the non-OECD group of countries is increased by a educational spending multiplier. The single scenario driver works equally on the individual non-OECD countries included in IFs, i.e., 148 of the 182 IFs countries.

A 50% increase in the education spending multiplier over a period of fifteen years from 2000 to 2015 (and a continuation of the increased expenditure thereafter) translates into a $45.3 billion increase in the annual government (recurrent) spending on primary education (irrespective of sources, domestic or international) by 2015 for all non-OECD countries combined (from $193.7 billion in 2015 in the base case to $239 billion in the same year in HESNO). This is about a 23 percent increase in recurrent public spending on primary education in the target year of MDG.

Averaged over the period, the annual additional spending for all non-OECD countries stands at $22.2 billion.

This additional spending will boost the net enrollment in the primary education in the non-OECD countries by about four and a half percentage point by the year 2015. However, even with the additional spending, the MDG target of one hundred percent net primary enrollment will still be missed by about eight percent in the target year 2015. Continued extra spending in the same rate till 2020, will take the net enrollment of the non-OECD group to 94.27 percent, which is only two percent off of the net enrollment in the OECD countries at present. The following figure (fig 5.9) shows the steady increase in the survival and net enrollment in the non-OECD group as a result of high spending.

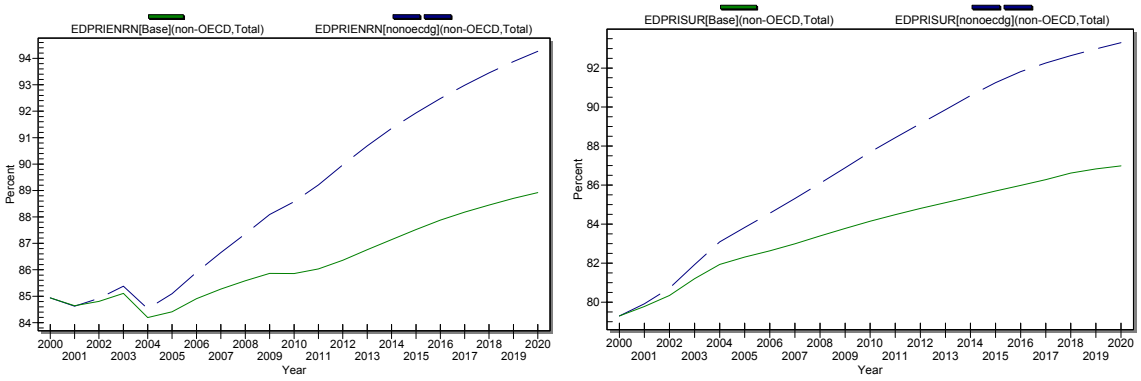

Fig 5.9 Net enrollment (left) and Survival (right) in the non-OECD in the HESNO scenario

The picture gets gloomier once we disaggregate the results. The different regions among the non-OECD group do not advance at the same rate or to the same point though. As seen in the disaggregated statistics presented in the appendix table (Appendix A) on regional net primary enrollment rates for boys and girls together, the region which advances most (about 10 percentage points gain over 15 years), i.e., Sub-Saharan Africa, is yet farthest from the goal by as much as 23 percent, i.e., one fourth of the kids in this region will still remain out of the school. In terms of additional funding, by the year 2015, Sub-Saharan Africa, under this scenario, will be spending an additional US$ 3.6 billion per year on primary education. Average additional annual financing in Sub-Saharan Africa is 1.475 billion dollar which is a bit higher than the World Bank estimate (Bruns et. al 2003) of about 1.4 billion dollar of annual external financing needed for the same region to reach the MDG. This implies that this region has to finance all its extra education spending from outside. The extra spending that is allocated to education in the HESNO scenario, will take out financing from the other public sectors of the resource poor SSA, as shown in the following table.

Table Display

Continue Refresh Graph Print Save Percent Cumulative Filter Display Run Horizon

	GDS[1]	GDS[5]	GDS[1]	GDS[5]
	UNDP SS Africa	UNDP SS Africa	UNDP SS Africa	UNDP SS Africa
	Health	Health	Other	Other
	Billion $	Billion $	Billion $	Billion $
Year	Base	nonoecdg	Base	nonoecdg
2000	10.12	10.12	32.99	32.99
2005	11.83	11.35	38.40	37.25
2010	13.58	12.62	44.18	41.87
2015	15.88	14.38	51.59	48.00
2020	19.03	17.48	61.56	57.91

South Asia gets about a 5% increase in net enrollment with an annual additional spending of more than 3 billion dollar. This spending is way above the World Bank (WB 2003) estimate of additional .14 billion dollars annual external financing gap for South Asia as a whole, even after the consideration of the fact that the WB 2003 estimate has four countries in South Asia (India, Bangladesh, Nepal and Pakistan) as opposed to the nine countries in the UNDP South Asia region including Iran, Afghanistan, Maldives, Bhutan and Srilanka. This means that South Asia will be able to manage most of the additional funding domestically.

5.3.2 Scenario 2: Further Interventions in Sub-Saharan Africa: SSA Rev and SSA Rev Aid Scenarios

As a next step, additional interventions were explored for Sub-Saharan Africa. Since a 50% increase in the educational expenditure multiplier was eating up money from other sectors, this time a lower increase of 20% is modeled. However, another multiplier on proportion of educational spending going to primary is shifted upward to funnel more money to primary education. Two different scenarios are developed on this increased financing base. In scenario 2a, the parameter called 'Government revenues multiplier' (govrevm) was changed for UNDP SS Africa. The initial condition of 1 is increased to 1.21 over 11 years. Values remain constant at 1.21 for the subsequent part of the horizon.
In scenario 2b, the parameter called 'Aid (foreign) donations as % of GDP' (aiddon) from OECD countries is increased to high. The initial condition for aiddon was set at .2. In scenario 2b, the value increase to 0.7, the suggested target for donor countries under global compact, over 10 years. Also as part of scenario 2b, the parameter called 'Aid (foreign) receipts as % of GDP' (aidrec) was changed for UNDP SS Africa. The base value is changed to high over 10 years. The contrasts between the IFs base case and the three scenarios (1, 2a and 2b) are summarized in the following graph (fig 5.10).

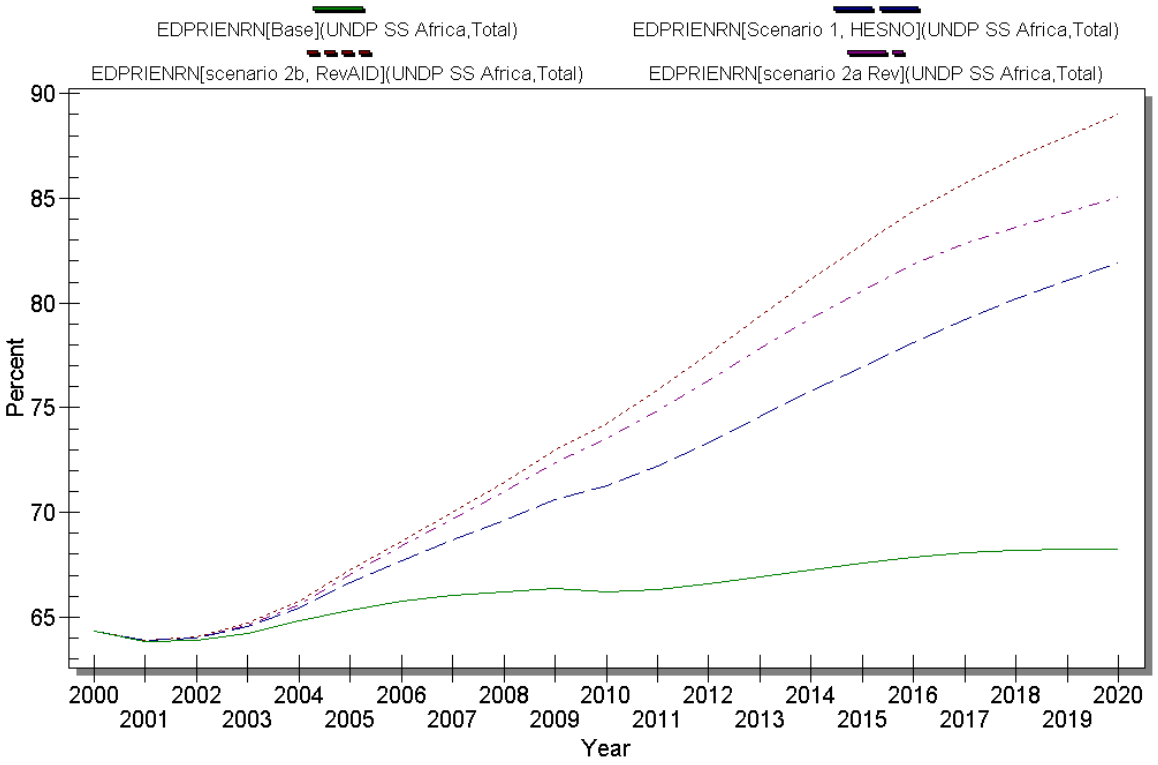

Fig 5.10 Comparison of the base case and the three scenarios for the Sub-Saharan Africa

With increased revenue destined for primary education, the net enrollment in primary education increases another four percentage points (compared to Scenario 1, by 2015). However, with increased aid there is a further increase of 2 percentage points only. Even with increased aid and domestic resource mobilization, Sub-Saharan Africa will not be reaching the MDG target by 2015. With an influx of aid and domestic resource generation the region will be close to an A grade (90%) enrollment by 2020.

6. Conclusions and Next Steps

This paper has validated the severity of the situation in the regions of Sub-Saharan Africa, South Asia and the Arab states. The paper also identifies structural impediments present in the under achieving systems in the forms of under-capacity, under-efficiency and under-participation. The most important finding of the paper is the possibility of missing this millennium goal because of the failure of additional funding to remove these structural constraints.
These findings do not by any means undermine the importance goal setting in primary education. Each time a goal is missed it is missed by a narrower margin and so will be the case for MDG, as discovered in this paper. Refinements in the dynamics and inclusion of more forward and backward linkages planned for a later version of the education model presented here will enable its users of the model to take up a long term analyses. Facilitating an integrated environment to explore the trade-offs and synergies between different development goals, IFs education model will enable us to estimate not only an approximate timeline but also the costs and benefits of universal primary education, achieved by either overcoming or out phasing the existing structural constraints.

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Appendix A

Comparison between the base case and the HESNO (high education spending in non-OECD group) scenarios

Region	Scenario	2000			2005			2010			2015			2000-2015	
		Per Student Cost	Tot Pri. Exp.	Net Enroll.	Per Student Cost	Tot Pri. Exp.	Net Enroll.	Per Student Cost	Tot Pri. Exp.	Net Enroll.	Per Student Cost	Tot Pri. Exp.	Net Enroll.	Average Annual additional Funding, billion $	Net Enrollment gain by 2015, %
		$/year	billion $/year	%	$/year	billion $/year	%	$/year	billion $/year	%	$/year	billion $/year	%		
UNDP Arab States	Base	405.2	12.9753	78.18	410.6	14.6148	78.01	474.6	18.7644	77.67	569.7	24.978	78.12		
UNDP Arab States	HESNO	405.2	12.9753	78.18	411	16.1784	78.64	478.7	22.383	81.47	582.9	31.9104	84.34		
Scenario cost and gain		0	0	0	0.4	1.5636	0.63	4.1	3.6186	3.8	13.2	6.9324	6.22	2.824	6.22
UNDP C&E Eur&CIS	Base	421	16.176	83.29	522	19.6836	85.83	625.4	22.6681	88.18	761.4	28.1342	90.54		
UNDP C&E Eur&CIS	HESNO	421	16.176	83.29	522.4	21.1494	87.96	627.9	25.9688	91.95	768.9	30.753	95.01		
Scenario cost and gain		0	0	0	0.4	1.4658	2.13	2.5	3.3007	3.77	7.5	2.6188	4.47	1.585	4.47
UNDP E Asia&Pac	Base	102.9	19.6042	94.37	139	26.3625	90.7	193.9	34.748	92.97	278.1	46.6115	94.53		
UNDP E Asia&Pac	HESNO	102.9	19.6042	94.37	139.1	29.1911	91.06	195	41.916	94.25	282.3	54.57	96.57		
Scenario cost and gain		0	0	0	0.1	2.8286	0.36	1.1	7.168	1.28	4.2	7.9585	2.04	4.89	2.04
UNDP Lat Am&Carib	Base	443.6	41.3055	94.24	472	44.022	94.41	527.1	50.6184	94.01	613.8	61.3263	94.73		
UNDP Lat Am&Carib	HESNO	443.6	41.3055	94.24	472.3	48.0384	93.69	529.3	59.3181	94.85	620.8	74.0145	96.72		
Scenario cost and gain		0	0	0	0.3	4.0164	-0.72	2.2	8.6997	0.84	7	12.6882	1.99	6.48	1.99
UNDP South Asia	Base	66.1	10.54404	81.34	82.62	13.7256	83.86	104.5	17.842	86.02	138.2	26.8821	89.11		
UNDP South Asia	HESNO	66.1	10.54404	81.34	82.69	15.183	84.75	105.2	21.842	89.36	141.9	36.022	93.97		
Scenario cost and gain		0	0	0	0.07	1.4574	0.89	0.7	4	3.34	3.7	9.1399	4.86	3.228	4.86
UNDP SS Africa	Base	79.29	6.59538	64.34	82.09	7.33495	65.34	84.35	8.23515	66.23	88.68	9.7008	67.58		
UNDP SS Africa	HESNO	79.29	6.59538	64.34	82.16	8.11335	66.65	84.95	10.15854	71.28	90.23	13.3096	76.97		
Scenario cost and gain		0	0	0	0.07	0.7784	1.31	0.6	1.92339	5.05	1.55	3.6088	9.39	1.475	9.39