

# Belfer Center for Science & International Affairs

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## **On Accelerating the Global Literacy Transition**

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This paper was written as part of the Research and Assessment Systems for Sustainability Program. The Program seeks to foster the design and evaluation of strategies with which the next generation of national and international global environmental change programs might more effectively integrate and support its research, assessment and decision support activities. In particular, we intend to catalyze and contribute to four interrelated lines of work: 1) broadening the science-defined agenda for studying global environmental change to engage more explicitly the socially defined agenda for sustainable development; 2) exploring the long-term trends in nature and society that serve as currents which can be used to navigate towards a sustainability transition; 3) deepening a place-based, integrated understanding of social and ecological vulnerability to global change; and 4) exploring the design and management of systems that can better integrate research, assessment and decision support activities on problems of global change and sustainability. The Program seeks to contribute to the evolution of strategies for pursuing these goals through collaboration among a small, international group of scholars and program managers involved in the production, assessment, and application of knowledge relating to global environmental change and development.

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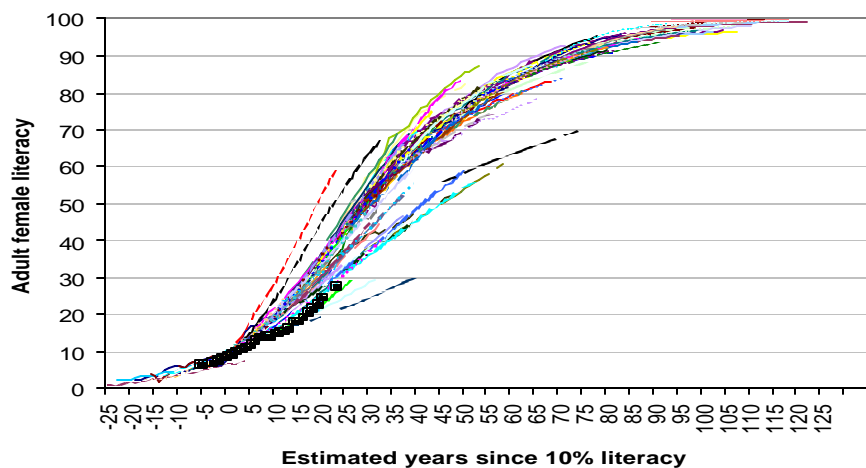


## Abstract

Literacy has been defined as one of the primary goals of the sustainable development. Two of the UN's millennium goals pertain to education. This paper examines the importance of literacy to sustainability, the speed with which literacy spreads in a country, and identifies factors, which can accelerate the literacy transition.

This paper suggests that most countries in the world are either in the process of an education transition to full literacy, and perhaps to universal full primary and secondary education achievements for all adults, or have finished this transition. A significant number of countries is far from completion. The work presented here shows that the transition has a general, sigmoid pattern. A statistical analysis shows 2/3 of countries is on a time path lasting 55-100 years for the transition from 10 to 90 percent adult literacy (the remainder is on a longer path). As literacy is an important skill in the modern world, it is important that we find ways to move slower countries, particularly those in the early stages of the transition, towards the 3 generation path.

This paper presents data on the education transition, identifies factors that accelerate the literacy transition and explores the fastest possible transition with a simulation model.



**The global literacy transition pattern – 130 countries' literacy by birth cohort grouped together to form the transition pattern. Source: World Bank Development Indicators 2001.**



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# **1 Summary**

## **1.1 Definition**

The most commonly used definition of literacy is a person's ability to "with understanding both read and write a short simple statement about his/her everyday life" (UN 1999). This definition is used in most national education policy statements from developing countries, it is used in national surveys, and it is used by the United Nations when discussing literacy. This is the definition used throughout the paper.

Literacy is one of the first skills learned in formal or non-formal education programs. The national (or regional) adult literacy rate is a strong predictor for another education measure, namely primary school attendance, and a weaker one for secondary school attendance.

## **1.2 The importance of literacy, primary and secondary school**

The three above mentioned education measures, literacy, primary and secondary school attendance, are positively correlated to personal income, economic growth, female empowerment, life expectancy, and lower fertility levels. This means that besides being a goal in itself, education facilitates a number of other vital sustainable development goals relating to poverty, equality, and health. At the same time, formal education can have the negative side effects: causing the erosion of age-old traditional knowledge, and leading to unfulfilled expectations and possible social unrest as a result. There is also no study to show conclusively that education is linked to environmental sustainability measures such as more efficient resource use, or low emissions. To the extent that literacy reduces poverty, it could reduce types of environmental damage caused by the very poor.

## **1.3 The global education transition**

This century has witnessed unprecedented rises in formal education around the world. In 1999, global male literacy was almost 80% and that of women almost 70%. There is great global disparity – adult literacy rates in 2000 ranged from 15 percent in Niger to 100 percent (UNESCO 2002), but it appears that all nations with incomplete literacy are moving along a similar sigmoid path towards a universal ability to read and write. The rise from 10 percent adult literacy to 90 percent takes from 60-100 years. The rise from 10 percent adult primary education (and even less secondary) to 90 percent secondary education among adults takes about 150 years, or 7 generations.

## **1.4 Factors that affect the speed of national education transitions**

Factors that contribute to a faster literacy transition include low, but sufficient funds per child of school age (in non-socialist countries the threshold was about \$500 in PPP in 1997); hiring enough teachers even if the pool of well-educated adults is small; and a short, targeted adult literacy program if overall literacy is above 60%. Countries can, and do, compensate for a small pool of well-educated adults by hiring a larger proportion of them as teachers. Children of educated parents and from wealthier households achieve better education results. There is some preliminary evidence that, within a country, education diffuses from a central city, to lesser cities and finally to rural areas.

## **1.5 The rise of female education**

Although women have less education than men and girls have lower access to school than boys in many countries, these gender gaps have been getting smaller, particularly since the 1970s. In 1970, average



national female illiteracy was 54 percent and male illiteracy was 36,<sup>1</sup> a gap of 18 percent. In 1999, the numbers were 29 and 18 respectively, a gap of only 11 percent. A large portion of the shrinking of the education gender gap is due to a worldwide rise in the *valuation* of girls' education. Female education is important for health and demography – children of educated mothers have lower mortality rates, and educated women have fewer children. It is also important for the position of women in society.

## **2 Background: what is literacy, how is it acquired, and is it a useful measure for sustainable development studies?**

### **2.1 What is literacy?**

The official UNESCO definition of literacy is the ability to “with understanding both read and write a short simple statement related to his/her everyday life” (UN 1999). Somewhat more advanced skills of functional literacy include the ability to engage “in all those activities in which literacy is required for effective functioning of his/her group and community and also for enabling him/her to continue to use reading, writing and calculation for his/her own and the community's development” (UN 1999). Literacy in the United States is defined in terms of grade level equivalents and basic functional literacy (ability to fill out forms, read the newspaper and other similar tasks) is reached at grade level 5.

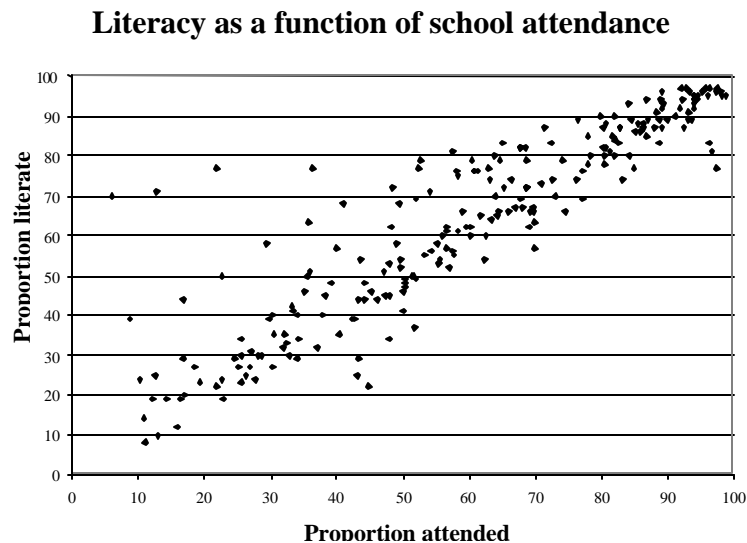
Neither of the more advanced definitions is widely used in global data collection. The most common counting of literacy is done around the world during national Population Censuses and Household Surveys, which include questions such as “Can you read a simple statement?” and “Can you write?” At that point, literacy is up to the respondent's subjective definition. That one of the most powerful measures of personal and social skills should ultimately be so un-objective may seem unfortunate. On the other hand, a person's own recognition of having reading and writing skills to a level that is useful or operational for him or her is perhaps the best definition possible. In this paper, this common definition of literacy is used. This is expedient – the most statistics are available.

### **2.2 How is literacy acquired?**

To a very large extent, literacy is the product of formal training – be it in a private religious school, a public primary school, or a non-formal education program. Theoretically, it could be passed on from parent to child, but statistics indicate that this is the exception. There is no data available to tell us what proportion of the adults who are presently literate went to school as children and what proportion went to a non-formal program, such as an adult education program instead. On a global level, the proportions must be small.

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<sup>1</sup> Global estimates of illiteracy are not given by the World Bank. These figures are based on an unweighted average of national literacy rates for all countries included in the World Bank Development Indicators 2001 database (World Bank 2001).



**Figure 1. Adult literacy rate as a function of the proportion of adults who attended primary school. Source of data: literacy from UNESCO database (2002); proportion attended primary from Barro and Lee education database (1996).**

Most people who are literate learned to read and write in school, as evidenced by Figure 1, showing a close correlation between the proportion of adults who attended school and the proportion who are literate. The literacy data in the figure is from the UNESCO database (2002); while the proportion attended school is from an education database compiled by Barro and Lee (1996). Literacy and primary school attendance are highly correlated, as shown in the figure for 230 observations of 77 countries for the years 1980-1985, and 1990. A simple regression produces an R-square value of .81, and the coefficient for percent attended school is .85 (0.028 standard deviation). It is not clear from the data whether the schools include semi-formal programs, such as village outreach posts, or what Pakistan might call non-formal basic education, but in any case, it shows clearly that most literacy is attained in an institution that is at least equivalent to primary school.

Many countries lie neatly along a central line. There are a number of outliers, which include the United Arab Emirates, Guinea-Bissau, Papua New Guinea and Myanmar, where literacy rates far exceed the proportions who attended school. This is due to data discrepancies between the two data sets used. School enrollment statistics 1970-1995 for these countries from the UNESCO ([www.unesco.org](http://www.unesco.org)), indicate that school intake and enrollment rates were in line with the high literacy rates.

Despite the predominance of schools for children, adult literacy education is important. It presents the means for a country to eliminate adult illiteracy directly, rather than waiting for schooled children to age and illiterate adults to pass away. Many countries with significant levels of adult illiteracy have adult literacy programs written into their national education policies. Most of these are developing countries. However, some industrialized countries, such as the United States also have such programs, primarily to raise literacy to a functional level, as a large proportion of adults there have very low reading skills.

The proportions of illiterate adults who participate in these programs vary from almost none, to sizeable numbers (17% in the Maldives in 1997 is one top-ranking). Table 1 shows the number of adult illiterates, and the proportion enrolled in a literacy program in 10 Asian countries. The numbers range from 0.3%

(Pakistan) to almost 17% (Maldives). Like enrollment, the success of adult literacy programs varies widely. For example, in Namibia from 1992-2000, 70% of the adults who enrolled in the Directorate for Adult Basic Education program graduated (SAIDE 2002; Office of the President, Namibia 2000). The program taught 70,000 of the 300,000 adults who were illiterate in 1992 to read and write. On the other hand, Burkina Faso, a country that has run “massive adult education programs” (SIL UK 2002) since 1975 has hardly succeeded in raising its adult literacy levels at all. The computer model discussed in the last section, was used to simulate historical school enrollment and adult literacy in Burkina Faso. Results show that all or virtually all of the adult literacy increase from 1980-1995 (from 11 to 19 percent) is attributable the maturing of children who went to school.

**Table 1. Illiterate adults enrolled in adult literacy programs in 10 Asian countries, in 1997.**  
**Source: compiled from ACCU online database (2002).**

	Number of illiterate adults (1995)	Enrolled in NFE Literacy programs (1997) x 1000	% of illiterates in literacy program
Cambodia	2 million (33 %)	12	0.6%
India	290 million (48%)	8100	2.8 %
Indonesia	22 million (6%)	1100	5.0%
Iran	11 million (29%)	478	4.3%
Maldives	6 thousand (5%)	1	16.7%
Nepal	8 million (36%)	564	7.1%
Pakistan	27 million (61%)	92	0.3%
Papua New Guinea	724 thousand (28%)	9	1.2%
Thailand	2.5 million (4%)	91	3.6%
Viet Nam	4 million (9%)	279	7.0%

### 2.3 Why focus on literacy as opposed to other education measures?

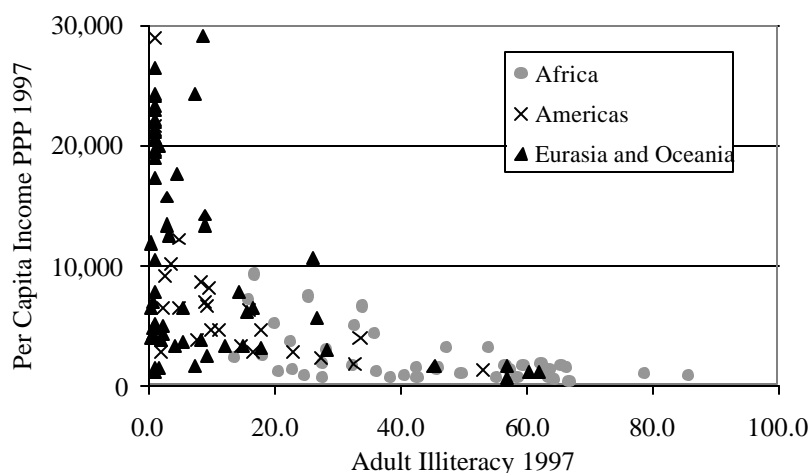
We focus on literacy because many findings show that education is positively correlated to a number of sustainable development measures, and literacy is the appropriate key education indicator in a world where illiteracy is high in many places.

Many of the world’s poorest people are stuck in poverty in part because they lack basic skills necessary to function in today’s world, such as literacy (the successful illiterate is surely a rare exception!). Clearly, reading and writing are extremely useful skills in a world replete with written communication. However, why not look at other, related skills, imparted through organized education, such as numeracy, advanced math, composition, the ability to interpret complex world affairs and local power structures based on a knowledge of history and politics. Readily available approximations of educational achievements beyond literacy exist, namely categorizations by primary, secondary, and tertiary education, also collected during censuses and surveys.

Earlier work on the correlation between the achievement of education and other positive development indicators, such as health and income, concluded that basic education was more important than higher levels (see Cassen 2002). Recent work has shown that secondary education can produce equally high incremental improvements as basic education. The present state of global education however, dictates that we begin with literacy. As of yet, the ability to read and write is by no means a universal skill. The

world's poorest countries in particular have very low adult literacy rates. Once literacy is universal, we can turn to a higher measure of schooling as the key education indicator.

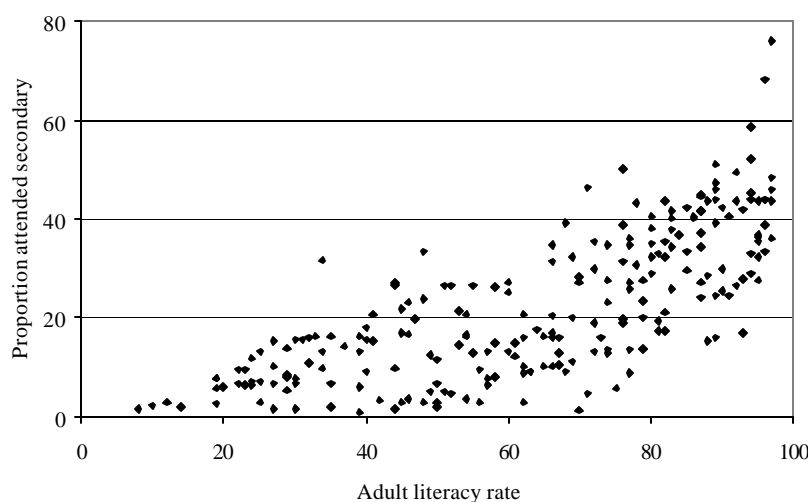
The figure below plots countries by literacy and income per capita (PPP). It shows that 1) there are still a large number of countries where a significant proportion of the adults – more than 20 percent -- cannot read and write, 2) that these countries are generally poor, and 3) that only countries with almost no illiteracy have high average income levels.<sup>2</sup> It indicates that near universal literacy is necessary though not sufficient for economic growth: among countries with complete literacy (stacked up at the left of the graph), there is enormous variation – some of which might be related to secondary education.



**Figure 2. Adult illiteracy and per capita income in 1997 for 142 countries grouped by Africa, Americas, and Eurasia and Oceania. Source: UNESCO online database (2002).**

Focusing on literacy gives us a proxy for primary school attendance, but less so for secondary and tertiary. The figure below shows that a positive correlation between literacy and secondary school attendance exists, but is not nearly as good, as that with primary school attendance. The relationship with tertiary education is less still – except in the very weak sense that secondary and tertiary education never exceed the literacy rate.

<sup>2</sup> The two countries with very high incomes but less than complete literacy are Hong Kong and Singapore, where income growth was very rapid, and which are somewhat special cases due to their urban nature.



**Figure 3. Proportion of adults who went to secondary school as a function of adult literacy rate, 230 data points for countries around the world in 1980, 1985, and 1990. Source: literacy data from UNESCO online database (2002); secondary school attendance from Barro and Lee literacy database (1996).**

### 3 What makes literacy important?

Besides its intrinsic value, literacy is also positively correlated with a large range of other indicators of sustainable development, such as reduced poverty levels, better health, and greater gender equality. It is also correlated with lower fertility levels, which indirectly has positive effects on sustainable development. Lower fertility slows population growth, which has positive effects, such as enabling higher social and capital investments (Coale and Hoover were the first to point this out in 1958), producing a more evenly distributed age-structure, and reducing environmental stress (all else being equal). Children from smaller families have a higher chance of surviving and going to school.

At the same time, education can be harmful. Obtaining the ability to read through an education program does probably reduce the transmission of traditional knowledge from one generation to the other simply because the younger generation is removed from the older during long hours while in school. In this way, much age-old and valuable wisdom is lost. Second, formal education creates expectations. Besides possible personal disappointment, this is potentially destabilizing for societies, particularly in situations where 1) economic growth is slow, 2) the ratio of young adults to older adults is large and 3) the older adults are significantly less formally educated than younger ones.

#### 3.1 Literacy and the reduction of poverty

Studies on education and income consistently find a positive relationship (Cassen 2002). It is however, important to note that while education reduces poverty, and the probability of being poor, education alone does not eradicate poverty. A global study by Barro (1991) showed that each percentage increase in primary school enrollment resulted in a 0.025 percent higher annual GDP growth rates in the subsequent 25 years. GDP growth is not sufficient to eradicate poverty, but countries with a higher level of average income per capita do have lower levels of absolute poverty.

Secondary school further increases GDP growth and reduces the likelihood that a household is poor. Cassen states “more and more assessments show higher returns to secondary than to other education” (2002). According to the same Barro study mentioned above, a percentage increase in secondary schooling led to a 0.030 percent rise in GDP growth (1991).

Most of the world’s poor are farmers in rural areas (according to household surveys in the past decade), and education increases farmer productivity according to Cassen (2002), thus providing a powerful lever to reduce poverty. A range of literature attests that education is important to agricultural productivity,<sup>3</sup> indicating that basic rural education could be a powerful lever to reduce poverty. The skills that a farmer uses to raise productivity include both literacy and numeracy and serve primarily to allow the farmer to use new inputs and techniques, to participate in agricultural extension schemes, and understand the biological processes in the crops.

Individual returns to education are undisputed. One can find them discussed in most entry-level development economics textbooks. The exact magnitude of the returns, and which education levels are most effective is under discussion. Household surveys of developing countries consistently find that those households with illiterate or less educated heads are more likely to be poor. Simple literacy may not be sufficient to completely erase the possibility that a household is poor, but it can reduce the probability and the depth of the poverty experienced.<sup>4</sup>

Interestingly, although economists are well aware of the financial returns to education, it is not a relationship that is universally analyzed in household surveys. All household surveys ask about education or literacy, and household expenditure. Therefore the data to find a correlation between the two variables is always there. But it is not always tabulated or even discussed in the reports – more attention is focused on poverty related to sector of employment, household size, and region of residence. Clearly, given education’s relevance to the probability of being poor, there is an omission here that needs to be rectified.

### 3.2 Literacy and female empowerment

There is a strong positive, and reciprocal, relationship between female education, or literacy, and women’s empowerment. According to the ICPD Programme of Action (UN 1994), “education, together with reproductive health, is one of the most important means of empowering women with the knowledge, skills and self-confidence necessary to participate fully in the development process” (Paragraph 4.2, excerpt). The two are so closely linked that Nobel Prize winner Amartya Sen regards women’s education as part of (rather than a means to) women’s empowerment in his latest book *Development as Freedom* (1999). The main mechanism by which education empowers women is that it gives them knowledge, it

<sup>3</sup> Cassen includes: Tilak, J. B. G. 1993. “Education and Agricultural Productivity in Asia: a Review.” *Indian Journal of Agricultural Economics* 48:2, April-June; World Bank. 1993. *The East Asian Miracle: Economic Growth and Public Policy*. Washington, D.C.; Lau, L., D. T. Jamison, S. K. Liu, and S. Rivkin. 1993. “Education and Economic Growth: Some Cross-sectional Evidence from Brazil.” *Journal of Development Economics* 41; Cotlear, D. 1989. “The Effects of Education on Farm Productivity.” *Journal of Development Planning* 19; and others.

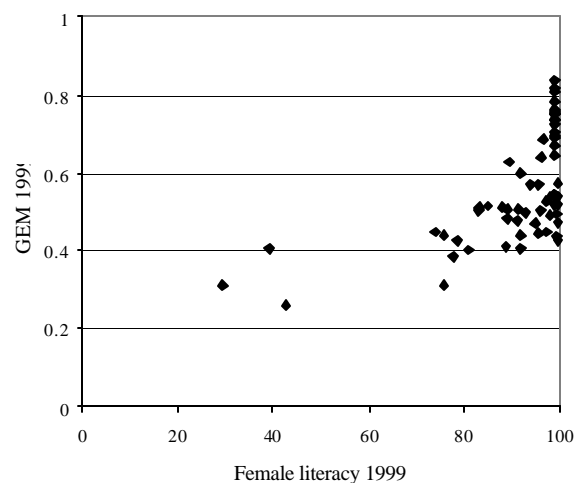
<sup>4</sup> A telling example from Zimbabwe household survey gave the following numbers:

Poverty prevalence	No school	Primary	Secondary	Tertiary
Rural	88	80	62	22
Urban	65	52	37	15
Depth of poverty	53	48	40	28

Source: Central Statistical Office of Zimbabwe 1998.

gives them a new perspective of their role, and it increases their ability to earn income. I was able to find the poignant story of a poor 15 year old Indian girl who used to be confined to the home, for whom basic literacy and numeracy skills meant self-respect, the ability to move about in the village, a relief from boredom, ability to make sure she was paid correctly, an understanding of the power structure in the village as well as the tools to engage in the politics of land ownership (Seeranine 1997).

A simple statistical measure of the relationship, on a global level could be, for example, the gender empowerment index as a function of the female literacy rate, shown in Figure 4. The gender empowerment index is a composite composed of female seats in parliament, female senior managers legislators, female professional and technical workers, and ratio of estimated female income to male income. The figure shows there is a positive relationship between GEM and female literacy. For those countries with complete female literacy, there is a positive relationship between female secondary school attendance and GEM (not shown).



**Figure 4. Gender Empowerment Measure (GEM) as a function of the female literacy rate in 1999.**  
Source: Human Development Report (UNDP 2001).

### 3.3 Literacy and infant mortality

Infant mortality, one of the major determinants of low life expectancy, is inversely related to education (Hobcraft 1993; Cassen 2002). In countries with high infant mortality, the rates were between 100-150 infant deaths per 1000 live births, compared to as low as 5 in industrialized nations. A regression on all the DHS surveys taken from 1995-1999 showed that primary school education of the mother lowers infant mortality by 18 deaths per 1000, and secondary school by an additional 25.<sup>5</sup> On average, primary education entails more skills than just literacy, since it takes 1-2 grades to learn to read and write a simple sentence, and primary school attendance can be up to six years. The DHS results are not tabulated by literacy alone, so we can only guess that the impact of literacy alone is somewhere in between the no-schooling and primary education level.

<sup>5</sup> The results had R square values of .86 and .90 for IMR and under five mortality respectively, and were highly significant at the 99% confidence level.

### **3.4 Education reduces fertility**

The negative relationship between female education and fertility levels is now well established. Amartya Sen is one of the most vocal publicizers of the relationship, as he sees a multiple-win situation where female education serves many development goals directly as well as indirectly addressing the problems caused by high fertility and rapid population growth. More educated women have fewer children than their less educated counterparts in a similar culture or economic situation. But education has a second, interesting effect. In some countries, such as Mauritius in the 1960s (Lutz and Wils 1994) and India today (Athreya 2001), even illiterate women reduce the number of children born – in order to be able to afford to send them to school.

For the purpose of this paper, a simple regression of female education and TFR using the same 36 demographic health surveys as above shows a significant negative relationship, shown in Table 2. On average, mothers with primary education have 0.7 children fewer than those with no schooling; and mothers with secondary or higher 2.3 fewer. While complete literacy (as approximated by primary school attendance) would not reduce total fertility rates in high fertility regions to replacement fertility (as the table below shows), it could be a significant step in that direction. In sub-Saharan Africa, the world region with the highest fertility rates, the average TFR of women with primary education in the surveys shown is 5.4 compared to 6.2 for those with no schooling. In Latin America – a region with very low illiteracy rates – TFR of the small group of women with no schooling is 5.6 compared to 4.4 for those with primary and 2.5 for women with secondary education. The overall fertility level in Latin America in 1999 was 2.6 – dominated by mothers with secondary education.



**Table 2. TFR by highest level of education of mother in 36 recent Demographic Health Surveys around the world. Source: Measure DHS, various years.**

	No education	Primary	Secondary or higher		No education	Primary	Secondary or higher
<b>Sub-Saharan Africa</b>				<b>North Africa/West Asia/Europe</b>			
Benin 1996	6.6	4.8	2.8	Egypt 2000	4.1	3.8	3.3
Burkina Faso 1998/99	6.7	5	3	Jordan 1997	4.6	4.5	4.2
Cameroon 1998	6.1	5	3.6	Turkey 1998	4	2.7	1.8
Chad 1996/97	6.4	6.7	4.8	Yemen 1997	6.9	5.5	3.5
Comoros 1996	5.3	4.8	3.6	Central Asia			
Cote d'Ivoire 1998/99	6.1	4.7	2.3	Kyrgyz Republic 1997	1.7	4.6	3.4
Ethiopia 2000	5.9	4.7	3.2	<b>South &amp; Southeast Asia</b>			
Gabon 2000	5.1	5.3	3.5	Bangladesh 2000	4.1	3.3	2.4
Ghana 1998	5.7	5	3.5	Cambodia 2000	4.3	3.8	2.7
Guinea 1999	5.9	4.8	3.5	Indonesia 1997	2.7	3.1	2.6
Kenya 1998	5.8	5	3.5	Nepal 1996	5.1	3.8	2.5
Madagascar 1997	6.8	6.5	4.2	Philippines 1998	5	5	3.3
Malawi 2000	7.3	6.4	3	Vietnam 1997	3.5	2.7	2.1
Mali 1996	7.1	6.5	4.1	<b>Latin America &amp; Caribbean</b>			
Mozambique 1997	5.1	5.4	3.5	Bolivia 1998	7.1	5.7	2.9
Niger 1998	7.5	6.2	4.8	Brazil 1996	4.9	3.3	2.1
Nigeria 1999	5.6	5.1	4	Colombia 2000	4	3.6	2.2
Senegal 1997	6.3	5.2	3.1	Dominican Republic 1996	5	3.7	2.5
Tanzania 1996	6.4	5.6	3.2	Guatemala 1998/99	6.8	5.2	2.9
Togo 1998	6.3	4.6	2.7	Haiti 2000	6.1	5.3	2.7
Zambia 1996	6.8	6.7	4.5	Nicaragua 1997/98	5.7	4.2	2.5
Zimbabwe 1999	5.2	4.5	3.3	Peru 2000	5.1	4.1	2.2

### 3.5 Education and environmental resource use

The impact of education on the environment is complex, mediated by its influence on socio-economic factors rather than direct, and complicated by delays and momentum. While literacy and higher level of education reduce population growth, thus mitigating environmental impacts, they also lead to higher incomes, which is usually correlated with greater natural resource use.

However, one should not overlook the effect of poor education on extreme poverty and with it some negative environmental impacts. Various estimates indicate that small, poor farmers, clearing frontier forests are one of the main proximate drivers of global deforestation today (see Carr 2002 for an easily

available overview). Lack of education is a contributing factor in two ways. Large proportions of these farmers have never been to school, and farm on cleared forestland because there is not another income alternative. Schooling would provide that alternative. Low educational achievement was found to be the key predictor of migration to frontier forests in a study of Guatemala (Carr 2002). High fertility rates among uneducated women can be one of the main propellers for the continuation of this kind of poverty-driven environmental damage because it causes the population of these poorest of the poor to continue to grow. Other, more general findings from Bangladesh indicate that country's efforts to mitigate environmental damage have been frustrated by the high illiteracy rate (Huq and Atiq 1987).

## 4 The global education transition

A recent paper presented at the IHDP 2001 Open Meeting (Wils 2001) showed that time series of national education achievements can be logically arranged to suggest a global pattern of education transition – moving from a largely illiterate society to one with high adult education levels and high enrollment ratios. The data used in that were roughly 50-year time series of cohort-specific literacy in 51 countries from the U.S. Census International Database (available online from [www.census.gov](http://www.census.gov)). Data presented here are overall adult literacy rates for 130 countries, 1970-1999, taken from the World Bank Development Indicators database (World Bank 2001).

In the 130 countries found in the database, literacy is consistently higher in more recent years. This indicates that more recent school enrollment rates were higher than those further in the past, because most people achieve literacy at an early age when they go to primary school. The collection of 130 segments can be rearranged in such a way that many of the lines fall together to form a single, cohesive envelope – the pattern of the global literacy transition. The origin of the pattern is a 10 percent literacy achievement. Along the x-axis is the estimated number of years since 10% literacy (assuming the 30-year segment is representative of the whole transition), and along the y-axis is the proportion of adults that is literate. The pattern is shown in Figure 5. From the figure, it looks like the education transition takes 3-5 generations to proceed from 10 to 90 percent literacy, has a sigmoid shape and that most countries are on that path. In fact, it turns out that the heuristic method of placing lines in this graph has led to some involuntary clustering. A more detailed statistical analysis by Wils and O'Connor (2002) shows that 67 percent of a subset of 45 countries (from the U.S. Census International Database) from around the world were on a 55-100 year trajectory. All of the remaining 33% were proceeding more slowly.

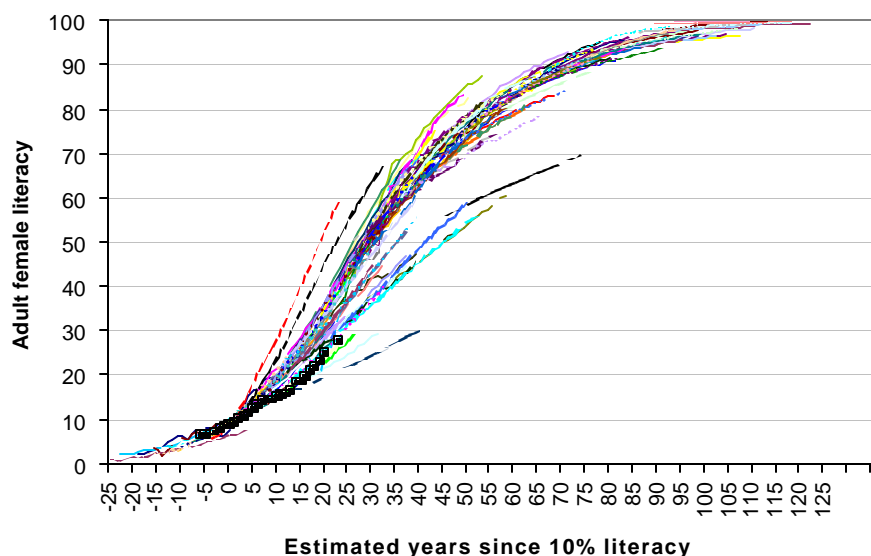
Even the fastest historically observed literacy transition takes 55 years. This is somewhat sobering, in particular if one considers literacy to be just the first phase of a more general education transition to higher education for all. On the positive side, in 1999 there were only 3 countries with overall adult literacy rates below 20%, compared with 47 in 1970. Also, if we take just the literacy of 15-24 year olds – a measure of more recent school enrollment and literacy gains – we see that 73% of the countries in the dataset had achieved literacy rates *above* 80% for young adults.

In 1999, adult female literacy (age 15+) in low- and middle-income countries was 65 percent.<sup>6</sup> If the low- and middle-income countries as a whole are moving through the middle of the literacy increase envelope, it will take only another 20 years before 90 percent of adult women in the developing countries can read

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<sup>6</sup> Calculated from female literacy rates in the human development report 2001 (UNDP 2001) and population estimates in the 2001 World Indicators Report (World Bank 2001). Total female literacy is an average weighted by population size. The estimate covers approximately 96 percent of the population in low- and middle-income countries. According to the UNESCO Regional Literacy Tables, the average female literacy rate in less developed countries in 2000 was 66.1% (UNESCO 2003).

and write. However, we should remain mindful that of the then remaining 10 percent illiterates many will be concentrated in countries with still high overall illiteracy rates.



**Figure 5. The global literacy transition pattern – 130 countries’ literacy by birth cohort grouped together to form the transition pattern. Source: World Bank Development Indicators 2001.**

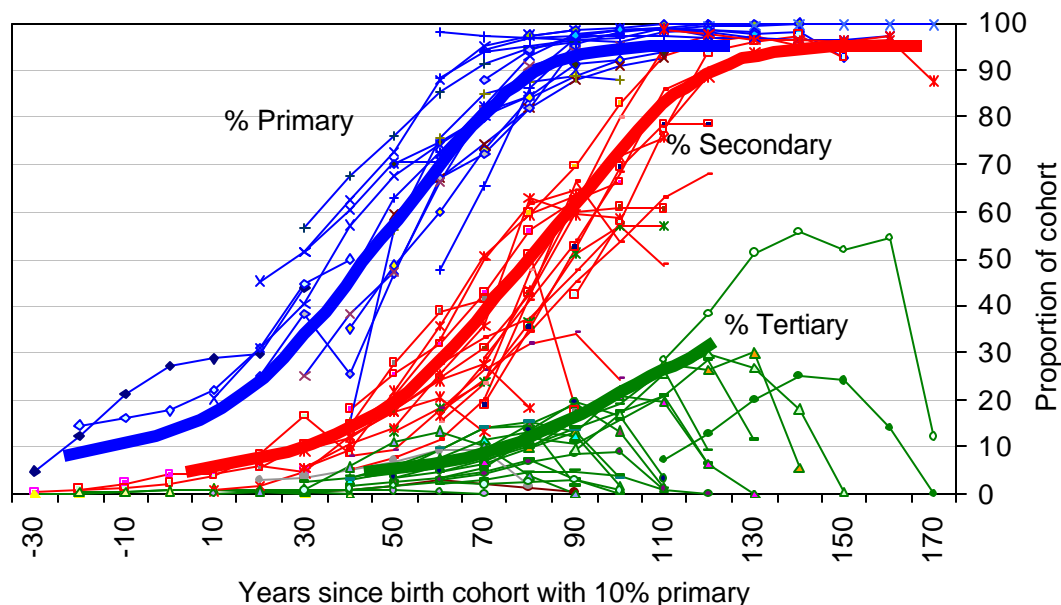
#### 4.1 Achieving primary, secondary and tertiary education

Although it is not the primary focus of this paper, it is interesting to present data on primary, secondary, and tertiary achievement over time for comparative purposes. Using the same criteria for arrangement the data suggest that primary and secondary school achievement rises according to a pattern very similar to that of literacy. Tertiary follows a different pattern.

For this exercise, I use recent census data for 22 selected countries from the UNESCO Statistical Yearbooks (UNESCO 1996).<sup>7</sup> Age-specific census data tell us the achievements of various birth cohorts. To the extent that these birth cohorts achieved primary and secondary school at approximately the same ages (a reasonable assumption), the age-specific data can be interpreted as a rough time-series of school-enrollment rises. I collected data in 10-year birth cohort intervals for the ages from 15 to 65+, resulting in time series of more than half a century. For each country, there are three line-segments, one for primary, and the second for secondary and the last for tertiary education. These segments are shifted around *together*. The data is arranged on a graph in a heuristic manner, similar to the literacy data discussed above, for primary schooling. But because the three line segments for each country are shifted together, the patterns for secondary and tertiary education fall into place *automatically* (a similar very preliminary experiment can be found for 1960-90 school enrollment by continent in Wils and Goujon 1998).

<sup>7</sup> The countries are: Burundi 1990, Mauritius 1990, Namibia 1991, Sudan 1993, Uganda 1991, Zimbabwe 1992, Canada 1991, El Salvador 1992, Mexico 1990, Panama 1990, United States 1994, Argentina 1991, Bolivia 1992, Ecuador 1990, Venezuela 1990, Bahrain 1991, China 1990, Hong Kong 1991, Bulgaria 1992, Ireland 1991, Sweden 1995, Norway 1990. The age groups are 15-19, 20-24, 25-34, 35-44, 45-54, 55-64, 65+.

Again, a rough general pattern appears, of the same shape as for literacy. As with literacy, the time between a cohort in which 10 percent has attended no primary to a cohort where 90 percent have primary education averages about 75 years. Secondary education follows along with a remarkably similar delay – about 30 years – and a remarkably similar slope for all the countries included. Tertiary education increases much more slowly than the other levels. The highest levels are found in industrialized countries, and the highest level by far in the United States (the declining levels for younger cohorts are due to the fact that people continue to enter tertiary education well into adulthood).



**Figure 6. School achievement by primary, secondary, and tertiary levels in 22 countries arranged by country along theoretical time to create a general pattern. Data source: UNESCO Statistical Yearbook 1996.**

It is impossible to tell what the future of tertiary education in industrialized countries might be. On the one hand, in the United States, cohorts from age 25-34 to 45-54 all have a little more than 50 percent post-secondary education. This indicates stabilization at least in the United States at this fairly high level. On the other hand, Norway, which achieved general secondary education far before any of the other 22 countries (in Norway 98 percent of those over 65 have secondary school), has much lower levels of post-secondary school attainment, merely a quarter of those aged 25-34 and 35-44.

Leaving tertiary education and its future as an unknown, one could venture that as far as school enrollment is concerned the shift from a cohort where 10 percent go to primary school to one where 90 percent achieve secondary education, takes a little less than one and a quarter centuries. This would leave countries – many of them in sub-Saharan Africa, which are in the beginning of this shift – at a disadvantage that they cannot hope to eliminate for 3-4 generations – even assuming that education in the industrialized countries remains stagnant, which it will not because of improvements already built into the education age-structure (younger cohorts are better educated).

## 5 What determines how fast literacy increases?

The main key to rising adult literacy has historically been child school enrollment, with adult education programs being a secondary force. How fast the child school enrollment translates into adult education levels is influenced by the age-structure of the population (more young mean a faster translation). On the macro-level, the overall enrollment rate appears to be positively affected by a low, but sufficient level of basic school expenditure per child of school age, the proportion of adults who have secondary education, and how many of these well-educated adults choose to or are able to become teachers. At any given level of child enrollment rates, the probability a child will attend school is positively related to small family size, household income, parental education, male gender, and urban residence. Successful adult education programs have occurred in countries where the overall literacy rate of adults is over 60% and where there is a focused government commitment to eradicate illiteracy in a short period. Some of the above factors are amenable to immediate policy or social intervention; others are not (such as the proportion of adults with secondary education). Strengthening those factors, which can be changed in the short run, would accelerate the transition to full, or 90% adult literacy. Those factors are: reducing family size (through family planning programs), ensuring sufficient funds for primary schools, hiring a large number of teachers – even if the pool of well-educated adults is small – and a focused, 1-10 year limited commitment to adult literacy programs, if overall literacy is over 60%.

### 5.1 Macro determinants of child school entry

On the macro side, the supply of schools and teachers is the major determinant of child school entry, and this supply is positively affected by a low, but sufficient, financial commitment, the proportion of adults who have secondary education, and where that proportion is low, a large section of these adults teaching. School entry rates are *not* correlated separately to a number of factors that one might suspect as causal agents: income per capita, the proportion of GDP spent on school, or the proportion of the population that is of school age (or the school dependency ratio<sup>8</sup>). Low school entry and enrollment rates can result when all three of the above factors constellate together to produce extremely low expenditures per school age child (low GDP, low school expenditure rates and a high school-age dependency ratio).

Teachers are one of the basic resources necessary for schooling, and can be a limiting resource. Ideally, teachers have finished training specifically for their profession, but in some countries, a shortage leads the government to hire untrained teachers.<sup>9</sup> Just how much education trained and untrained teachers have received varies from country to country, but in any case, it is likely to include at least some secondary schooling. In Bangladesh, informal BART schools – an extremely low input grass-roots initiative to help young girls – hire girls who have passed 8<sup>th</sup> grade – that includes 2 years of secondary schools.

One measure of a shortage of teachers is the pupil:teacher ratio. The following proximate factors to determine this ratio:

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<sup>8</sup> Children age 6-14/Adults age 15-64.

<sup>9</sup> According to the *Education for All 2000 Assessment* (UNESCO 2000a), in most countries a large majority of the primary school teachers were certified for their profession. Simple unweighted averages gave the following numbers for proportions of certified teachers (number of countries in parentheses): developing Americas – 68% (15); developing Asia – 85% (24); Africa – 75% (11); former communist countries in Europe – 18% (4).

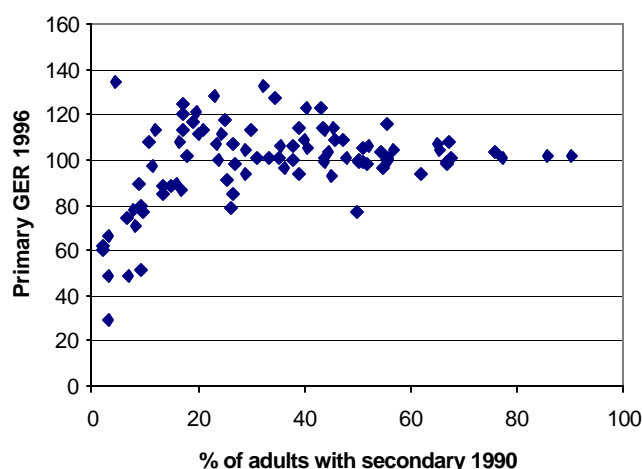
$$\begin{array}{ccccccc} \text{Child} & & \times & 1/(\% \text{ of} & \times & 1/(\text{teachers as} & \times & \text{Gross} & = & \text{Pupil: teacher} \\ \text{dependency} & & & \text{adult with} & & \% \text{ of adults} & & \text{enrollment} & & \text{ratio} \\ \text{ratio} & & & \text{secondary} & & \text{with secondary} & & \text{ratio} & & \\ & & & \text{education}) & & \text{education}) & & & & \end{array}$$

Gives:

$$\begin{array}{cccc} \text{Children per} & & \text{Children} & & \text{Children per} & & \text{Pupils per} \\ \text{adult} & & \text{per} & & \text{teacher} & & \text{teacher} \\ & & \text{educated} & & & & \\ & & \text{adult} & & & & \end{array}$$

These proximate factors account for 91%<sup>10</sup> of the variation in the pupil:teacher ratio in 73 countries from around the world for which all the data were available.<sup>11</sup> The fit is not perfect because the dependency ratio (children age 0-15 per adult 15-64) is not a perfect measure of the number of children of school-going age.

A very low proportion of adults with secondary education is likely to cause lower enrollment ratios (see Figure 7). For countries with less than 30 percent of adults with secondary education in 1997, the low education level of adults “explains” half of the variation in the gross enrollment ratio (R square is .51, and each % increase of adults with secondary leads to 2.5 point greater gross enrollment ratio). The implication of this finding is that child enrollment ratios follow rising proportions of well-educated adults – one needs to have educated the previous generation in order to educate the present generation. This mechanism produces a powerful lag-factor that puts limits on the maximum speed for the education transition to occur. This paper explores just what those maximum limits are in section 7. One can point to history and say that the fastest transitions from 10 to 90 percent school entry was about 35 years, which would translate into about 55 years for overall adult literacy to rise to 90 percent (assuming the country had a fairly young age-structure).

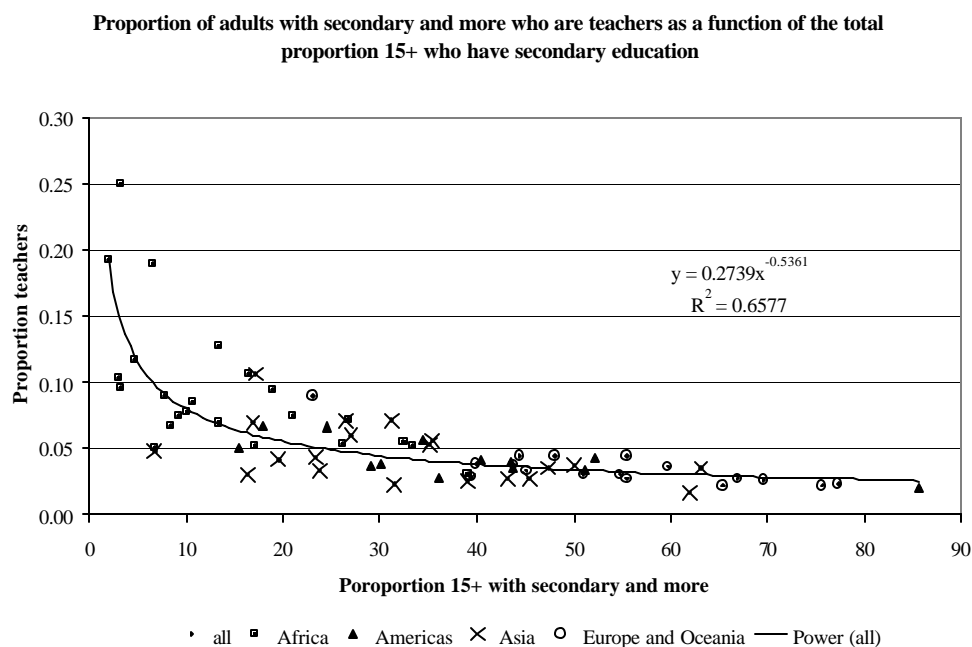


**Figure 7. Gross enrollment rates as correlated to the proportion of adults with secondary education in 1990. Source: calculated from UNESCO 1999; Barro and Lee 1996.**

<sup>10</sup> Doing a regression on the logs of proximate factors.

<sup>11</sup> All of the data used came from the UNESCO web site, <http://www.unesco.org>.

One way to counter the dragging effect of a low proportion of adults with secondary education in the short run is to hire more of them as teachers. There is a trade-off: educated adults working as teachers cannot be doing other important skilled work. Indeed, it turns out that there is a tendency for countries with a shortage of educated adults overall to use the short-term solution of hiring a larger proportion of those as teachers to improve their school system. Figure 8 below shows the proportion of adults age 15+ with secondary education<sup>12</sup> along the x-axis, and teachers as a proportion of the adults with secondary education on the y-axis. There is a clear negative relationship, which even looks like it is non-linear (the highest R values on a regression were found with a power relationship). Many of the countries on the left side of the figure (with few adults who have gone to secondary school) are in sub-Saharan Africa, and those countries are hiring up to 25% and over of those valuable skilled people as teachers (the highest values in 1990 were Tanzania – 25%; Mozambique – 19%; Uganda – 19%).



**Figure 8. Proportion of adults with secondary and higher education who work as teachers as correlated with the overall proportion of adults with secondary and higher education in 1999. Source: calculated from UNESCO 1999; Barro and Lee 1996.**

Countries which compensate for low education values among adults by hiring more of the skilled adults as teachers have significantly higher gross enrollment ratios as the table below shows (based on data from the *World Education Report 2000*, UNESCO 2000b). Mozambique, Tanzania, and Uganda all have gross enrollment ratios about three times as high as Mali, Niger, and Afghanistan, at similar levels of adult education, but different proportions hired as teachers. Uganda and Tanzania are at the top of the education transition envelope discussed in section 4. The three countries, which hire a high proportion of the educated adults as teachers have a high public commitment to basic education.

<sup>12</sup> From the Barro-Lee dataset (1996).

**Table 3. The proportion of educated adults working as teachers, the proportion of adults with secondary education, and gross primary enrollment ratio in six sub-Saharan countries, 1997.**  
**Source: calculated from UNESCO 1999; Barro and Lee 1996.**

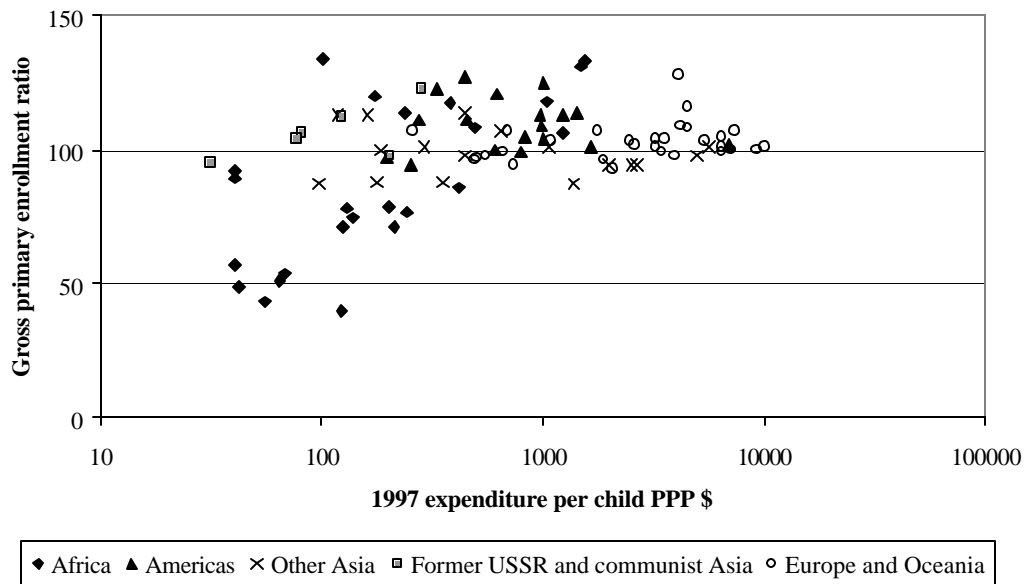
Country in 1997	% of educated adults working as teachers	% of adults with secondary education	Gross primary enrollment ratio
Mozambique	19	1.9	67
Tanzania	25	3.2	70
Uganda	19	6.6	74
Afghanistan	5	6.8	27
Mali	10	3.1	26
Niger	10	3.2	29

National primary school expenditures per school age child also influence gross enrollment rates, but only up to about \$500 per child (PPP) in non-socialist countries. At rates above \$500 per child, gross primary enrollment is 100 or above. In socialist countries, or post-socialist countries, high enrollment rates are achieved at much lower expenditure levels. The proximate determinants of expenditure per school age child are:

GNP per capita	x	% of GNP per capita spend on education	x	% of education expenditure spent on school level	x	1/(% of population of school level)
\$ per person available		\$ of education per person		\$ of education at level per person		\$ for education at level per child

These proximate determinants (calculated for 96 countries with data from the *World Education Report 2000*, UNESCO 2000b) correlate 98% with the figure for expenditure per pupil. Each of these proximate determinants separately has no correlation to school enrollment; only the product does, and even then, the relationship is not terribly strong, and that only in sub-Saharan Africa. In countries of the former USSR and socialist Asia (China and Laos), there are very high enrollment levels with very low expenditure.





**Figure 9. 1997 primary school expenditure per child of school age correlated to gross primary enrollment ratio. Source: calculated from UNESCO 1999.**

## 5.2 Micro level determinants of child school entry

At a given national level of school enrollment rates, some groups of children have a higher probability to go to school than others, namely those who have fewer siblings, whose parents are more educated and have higher incomes, boys, and children living in cities. The mechanisms for these correlations are straightforward if not always uni-directional.

### 5.2.1 Household characteristics

Lloyd and Blanc (1996) and Lloyd (1993) showed the household relationships to school enrollment. The basic issues are financial wherewithal to send children to school, and motivation or understanding of schooling. Children in households with fewer competing siblings, with a higher income, and with more highly educated parents are more likely to receive the financial and emotional support to go to school.

A study of 7 countries in sub-Saharan Africa<sup>13</sup> found that children of educated parents and living in a household with a higher standard of living enjoy higher probabilities of being enrolled in school, and a higher probability of completing at least grade 4 (Lloyd and Blanc 1996). The study shows that in the countries studied, a child who lives with a household head who has completed 7 or more years of school (i.e., at least some secondary) has an 8-39 percentage points higher probability of being in school, and a 1-21 percentage point higher probability of completing grade 4. There were two countries, Kenya and Namibia, where the even the enrollment rates of children living with household heads who had not gone to school were high, .88 and .92 respectively, which shows that low education levels of household heads can be overcome. Both of these countries have successful education programs.

<sup>13</sup> Kenya, Tanzania, Cameroon, Niger, Malawi, Namibia, Zambia

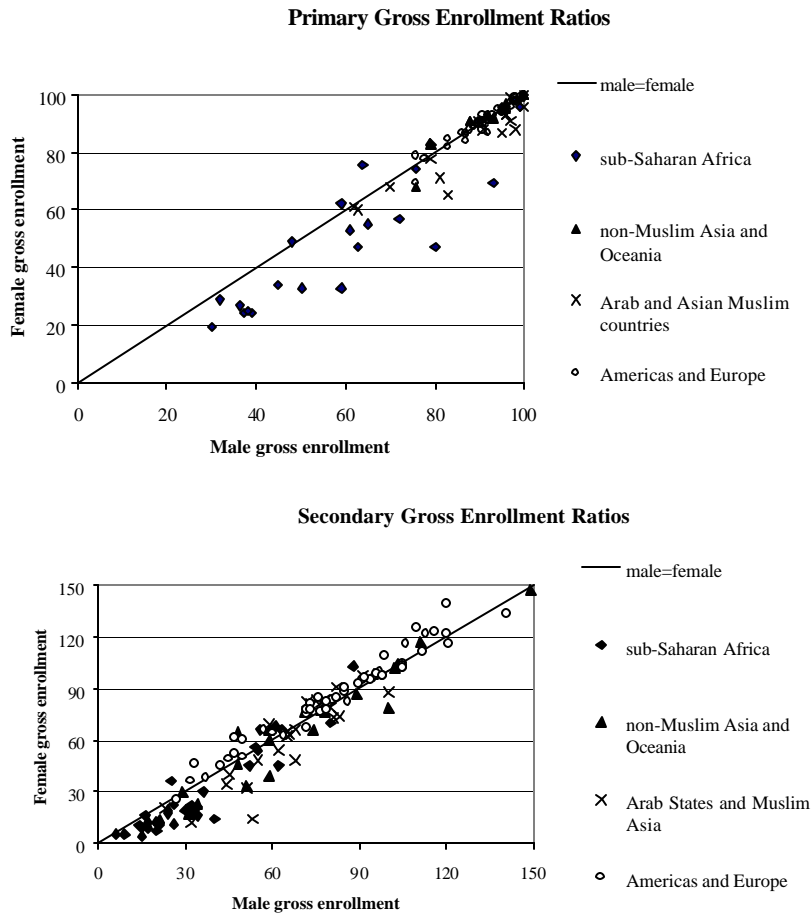
Children living in a household with a “high” standard of living had a 6-23 percentage point higher probability of being enrolled, and a 13-38-percentage point advantage for completing grade 4, as compared to children in households with a “low” standard of living.<sup>14</sup> Education of household head and household standard of living are doubtlessly causally related, but the authors do not address this issue, so we don’t know which factor is most important to a child’s schooling. Interestingly, the study shows little relation with enrollment and the number of siblings, although other studies (Colclough and Lewin 1993) indicate that high fertility rates are an impediment to enrollment, and recent studies in India suggest that many unschooled parents restrict childbearing in order to send the smaller number of children to school (McNay et al. 2002).

### **5.2.2 Gender bias**

In many countries, girls have a lower probability of being in school than boys. Figure 10 shows female gross primary enrollment as a function of male gross primary enrollment. Where the points lie below the equality line, girls are disadvantaged. In 1996, most countries enjoyed high rates of gross primary enrollment above 80, and at these levels, boys and girls are generally equally enrolled. Girls are most obviously disadvantaged in sub-Saharan African countries with low gross enrollment ratios. Whether this is due to a cultural bias or to a general pattern where at low levels of enrollment boys are always preferred is impossible to tell from this diagram. Girls are also at a disadvantage in a number of (not all) Muslim countries, where some inequality persists even at very high levels of male school enrollment – levels where the gender disparity disappears in other countries.

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<sup>14</sup> Lloyd and Blanc (1996) used DHS household surveys as their source of information, which do not provide information on income, but do have statistics on various household attributes. The authors developed an index of household living standard for their study.



**Figure 10. Female gross enrollment ratios in primary and in secondary school as a function of male gross enrollment in primary and secondary in four major country groups: sub-Saharan Africa, non-Muslim Asia and Oceania, Arab countries and Asian Muslim countries, Americas and Europe. Source: UNESCO 1999.**

Gender biases or differences in secondary education look quite different. First, secondary enrollment shows that gross secondary enrollment ratios in 1996 were much lower than primary, so one might expect large male-female inequality. In fact, the male-female differences are much smaller than those for primary at similar levels of male enrollment. Countries in sub-Saharan Africa are again grouped at the lowest enrollment rates, and girls are disadvantaged as in primary education. In the Arab and Asian (Muslim and non-Muslim) countries, the secondary enrollment rates of girls are lower than boys' in a little over half the countries, even at relatively high levels of enrollment. In the Americas and Europe on the other hand, girls enjoy higher rates of secondary school enrollment in most countries, at low as well as high levels of male enrollment. These patterns suggest that there are real cultural differences between the broad geographical areas, but they are not enormous.

Girls are rapidly catching up to boys in school enrollment, and that trend will eventually translate into more equal levels of education between men and women. As an example of this trend, the average ratio

of male: female gross primary enrollment<sup>15</sup> was 1.49 in 1970; 1.22 in 1980; 1.16 in 1990, and 1.13 in 1996<sup>16</sup>. There are two reasons girls are catching up to boys.

- 1) School enrollment increased significantly throughout the last century and at higher levels of school enrollment, inequalities between boys and girls are smaller (Wils and Goujon 1998).
- 2) Since about 1970, inequalities between boys and girls have declined *regardless of the general level of school enrollment*. This second trend is particularly significant because it means that efforts directed specifically at improving girls' access to schooling have paid off.

Figure 11 shows the male primary school gross enrollment rate in 1970, 1990, and 1996 cross tabulated with the ratio of male:female enrollment using UNESCO data.<sup>17</sup> The figure shows a clear negative relationship between the two enrollment variables. At high levels of male enrollment – 80 to 120 – there is mostly equal male and female access to school. Exceptions are visible for the 1970 data. At low levels of male enrollment below 50, girls are always disadvantaged. Regressions – separately for all three period intervals, and for all four years together – confirm the visual impression. Male enrollment explains a part of the boy advantage in school enrollment at a highly significant level for all four experiments.

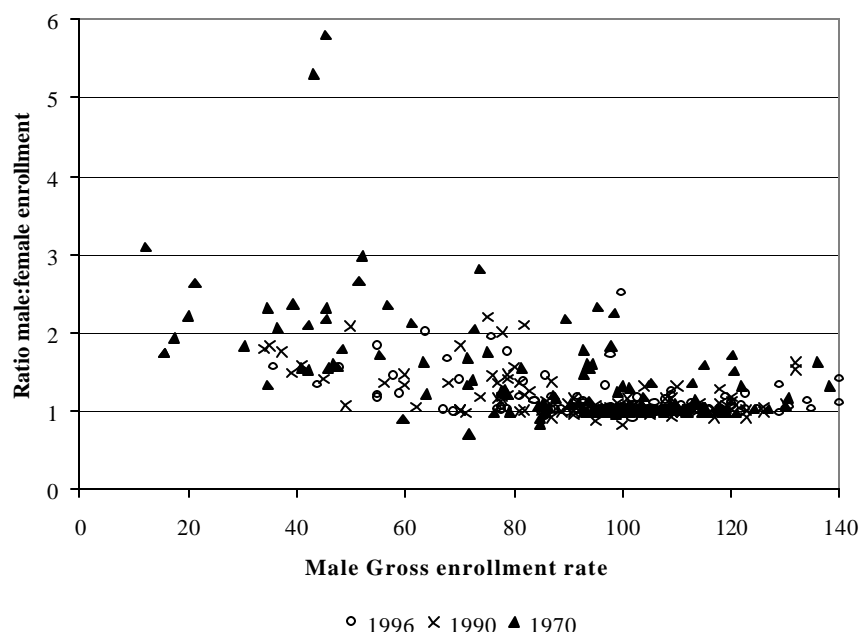
Independent of the effect of rising overall enrollment rates, there appears to have been an increase in the value for girls' education over the observation period. The year of observation accounts for some of the variation in the ratio of male: female enrollment. The result is highly significant and strongly negative for the 26-year period as a whole, -.009, with a standard error of .0025. That means each year, the ratio of male: female enrollment rates improved by almost .01 points from changes other than overall school improvements, and in fact accounted for *most* of the improvement in the ratio of male: female enrollment between 1970 and 1996. The attempt to separate out the period effect led to mixed results. Results for two of the three time intervals were not significant with regards to the period, although the signs of the coefficients in each regression experiment are in the expected direction. While inconclusive, the results imply that the changing value for girls' education may have been stronger in the 1970s and 1980s than it was in the 1990s.

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<sup>15</sup> Defined as the total number of people in primary school regardless of age divided by the population of the official school age.

<sup>16</sup> Unweighted average for 89 countries – country population not considered. School enrollment data for 1970, 1980, 1990, and 1996 from UNESCO. The data are based on information provided to the UNESCO by national agencies, which collect data on the number of children enrolled in official schools (UNESCO 2002).

<sup>17</sup> Ibid.

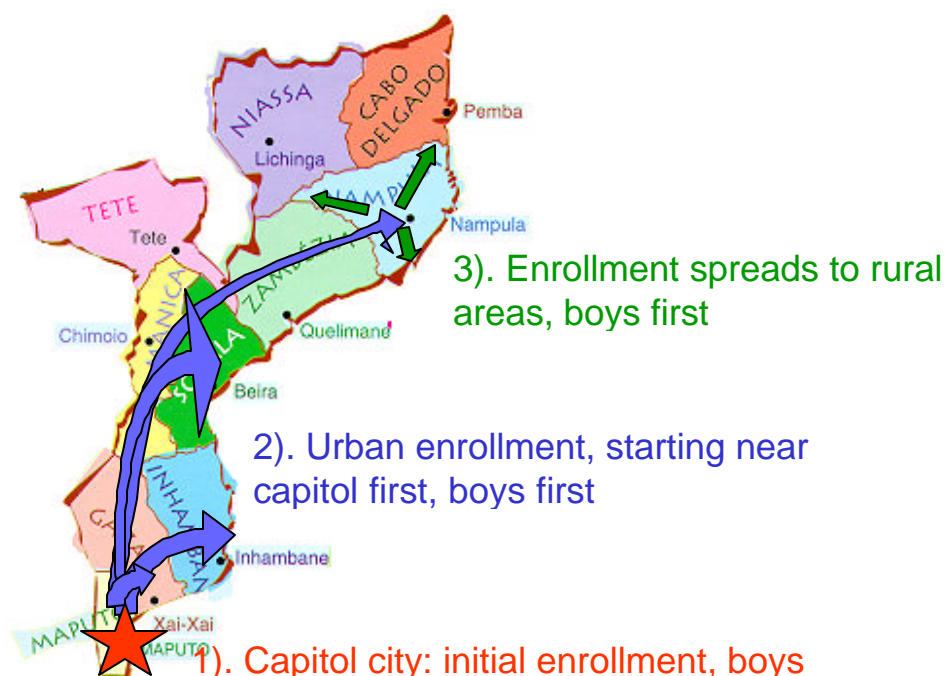


**Figure 11. Male gross primary enrollment rates and the ratio of male: female enrollment rates in 195 countries, 1970, 1990, and 1996. Source: UNESCO online database (2002); UNESCO 1999.**

### 5.2.3 Urban school enrollment rises before rural

School enrollment begins in cities and then diffuses out to rural areas. At less than complete national school enrollment levels, the rural areas will have lower; in many cases significantly lower enrollment rates than the urban areas. In the education transition interval, there can be enormous gaps between various geographical regions in a country.

Evidence from Mozambique, a country with over 50% adult illiteracy in 1999, suggests a core-periphery diffusion pattern where schooling first starts in the capitol, leap-frogs to other urban centers in order of distance from the capitol, and then diffuses out to rural areas from these centers, reaching rural areas far from the capitol city last. The process in Mozambique was as follows. Education rises began in the capitol, Maputo City (then Lourenco Marques) in about the 1920s and 1930s. Today, adult literacy rates in the capitol are high. From there, schools diffused to other cities, first those near to Lourenco Marques and finally reaching those in the far north. A little later, education in rural areas started, in the 1950s and 1960s in the areas around the capitol. Today, they are only beginning to rise in the northern rural areas in response to the present government's aggressive campaign to send all children to primary school. While it is premature to conclude that similar diffusion patterns have occurred or are in process in other countries, the pattern conforms to the more general core-periphery literature, which suggests that we might find similar diffusion trends in other countries. Some of the knowledge about accelerating geographical diffusion, from this more general literature, could be helpful in accelerating the education transition. It is too early to do anything more than speculate on this.



Map: Eduardo Mondlane University Informatics Centre,

**Figure 12. Diffusion of school enrollment in Mozambique in this century. Based on Wils and Gaspar (2003).**

While it is beyond the scope of this paper to do a full review of all the primary data and literature pertaining to school enrollment differences between rural and urban areas, I do want to provide two random examples, taken from analyses of recent household surveys in Africa, which show the extent of the differences. The 1998 Ethiopian household survey found enormous urban/rural differences in enrollment, much larger even than enrollment inequalities by household income (Zekaria 1999), while the 1995 Burkina Faso survey found large differences both by income and by urban/rural location (Bayala et al. 1997). Gender differences, similarly large, were also tabulated for Burkina Faso and are reproduced here. In both countries, urban primary school enrollment rates are about twice as high as in rural areas. The income and gender effects compound urban/rural differences. The story of these data appears to be that income and gender effects are smaller if the overall rate of enrollment is higher. At low overall enrollment, inequality is greatest. For example, in Burkina Faso, among the most disadvantaged group, rural girls, income mattered most. I believe one can propose some kind of sequential convergence idea here – which would predict that eventually primary school enrollment will be equal and complete for all groups, regardless of income, location or gender, and that wealthy, urban boys will reach full enrollment first, and poor, rural girls last.

**Table 4. Gross primary enrollment rates for children in different household types in Ethiopia, 1998, and Burkina Faso, 1995. Sources: Zekaria 1999; Bayala et al. 1997).**

Expenditure	1 <sup>st</sup> quintile	2 <sup>nd</sup> quintile	3 <sup>rd</sup> quintile	4 <sup>th</sup> quintile	5 <sup>th</sup> quintile
Ethiopia					
Urban	95	110	105	108	115
Rural	37	38	42	47	55
Burkina Faso	Poor boys	Non-poor boys		Poor girls	Non-poor girls
Urban	40	91		36	78
Rural	26	40		9	49

## 6 Elements of successful adult literacy programs: the proof is in the census pudding

Adult literacy programs can successfully lower the adult illiteracy rates quickly and have recently done so in a number of cases. Some countries have instituted long-term adult literacy programs intended to gradually eradicate adult illiteracy; other countries have chosen brief, intense campaigns. One must be wary of the self-reported success rates of such programs and campaigns – there is a natural tendency to exaggerate success. When the reported successes from a campaign are compared to changes in adult literacy as established in a general population census a few years after the campaign, or in later evaluation reports, the impact often turns out to be less than claimed. With this more wary approach, it appears that a number of claimed great success stories remain, while for others turn out not to withstand the judgement of time.

### 6.1 Successful adult literacy schemes 1: the case of Kerala and India

It is likely that worldwide, the most successful adult literacy schemes are from Kottayam town and the Ernakulam district in the Indian state of Kerala. In the late 1980s, reports on the literacy campaigns in these areas claimed that both areas became fully literate in a matter of *100 days* and *one year* respectively, as the result of an intense literacy *campaign*. In Ernakulam, reports claim, literacy was raised a whopping 21 percent from 77 to 98 in twelve months. The following year, application of the scheme to all of the state eradicated illiteracy from all of Kerala.

A review of the more sombre census data from 1981, 1991, and 2001 shows that Kerala is indeed the most literate state in India, but it is not 98% literate as the campaigns claim. In 1981, the adult literacy rate, according to the census, was 82%; in 1991 it was 90% and in 2001 it was 91%. In Ernakulam, the showcase district, the literacy rate in 1991 was 92% and in 2001 it was 93%.<sup>18</sup> How much did the literacy campaigns contribute to the literacy rise between 1981 and 1991? I could not evaluate exactly. However, even 10 years later, reports evaluating the campaigns are still very positive. The fact that the drive is organized as a temporary campaign no doubt facilitates the recruitment of enthusiastic volunteers.

The success in Kerala prompted the Indian National Literacy Mission to abandon its previous center based approach and to focus on literacy campaigns. The success of the literacy campaigns elsewhere is not nearly as impressive as in Kerala (perhaps predictably), although India did register its largest ever

<sup>18</sup> Data from the web sites of the Office of the Registrar General, India 2000; Encyclopedia Britannica India 2002; Department of Education, India 2002; and Government of Kerala 2002.

intercensal literacy increase (population age 7+) from 1991-2001. In this most recent intercensal period, literacy increased by 14%, compared to less than 9% from 1981-91. *Frontline*, a national Indian magazine, had this to say about the literacy increase in the 14-27 Apr 2001 issue: “Certainly, the participatory mass literacy campaigns of the 1990s, especially the early ones which had somewhat of a free run before becoming hopelessly bureaucratized, did score significant success. Even where the mass literacy campaigns were not particularly successful in terms of literacy achievement, *they did motivate non/semi-literate parents - especially the mothers - in a big way to send their children to school* (my emphasis). Much of the increase in the overall literacy rate has to be attributed to improved enrollment and retention ratios in primary/elementary schools” (Athreya 2001).

## **6.2 Successful adult literacy schemes 2: adult basic education in Namibia**

Not all successful programs have to be innovative, nor campaign and volunteer based. Namibia has a successful Adult Basic Education program that is based on centers of learning, a centrally organized curriculum, and centrally trained teachers. The program teaches reading, but also seeks to empower its learners to function better in the Namibian society. In 1991, just after independence, 35% of the adult population (15+) in Namibia was illiterate, about 300,000, mostly in remote areas and among certain ethnic groups. The government set the goal to reduce the illiterate proportion to 20% by 2000 and to do so established the Directorate for Adult Basic Education in 1992. The program has expanded from about 15,000 learners in 1992 to 46,000 in 1999. As of 2000, about 70,000 adults had passed the basic literacy level of that course (SAIDE 2002). Unfortunately, the figures from the 2001 Census were not out at the time of writing, so we have to go with estimates. According to the World Bank literacy statistics, Namibian adult literacy rose from 76% in 1991 to 83% in 2000, a fairly average increase in that literacy range. It was not possible to assess how much of this literacy rise is attributable to the adult literacy programs.

## **6.3 A less successful story: Nicaragua**

One adult literacy campaign story of which conflicting evaluations abound is that of Nicaragua. After the Sandinistas came to power in Nicaragua, in 1980, one of the government’s first actions was the National Literacy Campaign. It lasted six months, involved 90,000 volunteers (mostly secondary school pupils) and reached almost all of the 45% illiterate adults. It was however, quickly aborted as a result of the eruption on civil war. In one year, according to the reports, illiteracy was reduced from 45% to 13%.

More than 20 years later, materials available from the Internet recount the program was a staggering success. And probably, if measured in terms of the number of people reached, and the speed with which it was implemented, it was a success. However, a review of all international literacy data, which are based on census results, indicate that the campaign barely had a lasting impact, and in fact, the adult literacy rate in Nicaragua virtually stagnated from 1970 to 2000. According to the Literacy Exchange, hosted by UNESCO, the 1970 literacy rate in Nicaragua was 55% and in 2000, it was 66%. The country has the slowest rates of literacy increase of any country included in any way in this paper. According to the report on Literacy Exchange, the campaign was not a lasting success because of the ideological content of the teachings caused many students to leave (in addition to reading and writing, revolutionary ideas were transmitted) and because the civil war forced the Sandinista Government to abandon its ambitious social program to focus on survival (UNESCO Institute for Education 2002).

However, one should not be quick to blame the Sandinista government for the excruciatingly slow literacy progress in Nicaragua. War is one of the most devastating occurrences for education – as reflected in the Dakar Education for All Global Synthesis report (UNESCO 2000a). Like all aspects of development, peace is a prerequisite for improvements in education. This shows up in Nicaragua. It showed up in Mozambique where school enrollment declined during the civil war 1978-1992, only to rise



spectacularly since the war ended. And most recently, hopefully with time to come to fruition, in the return of girls to school in Afghanistan.

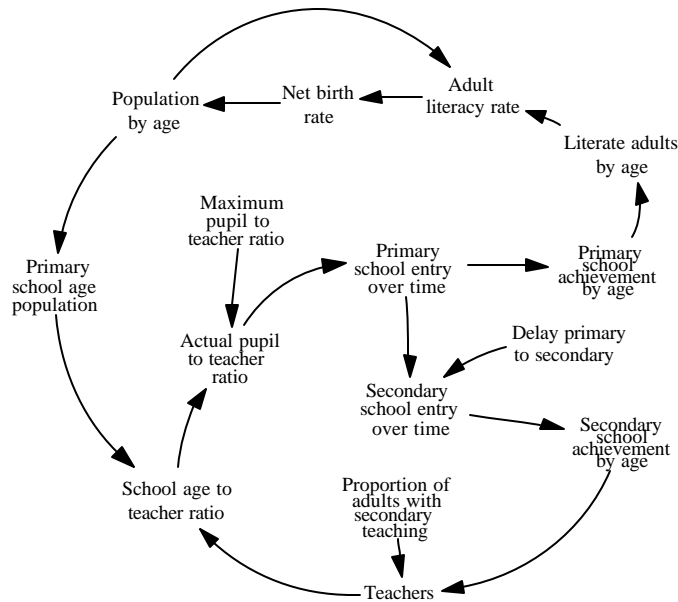
## 7 Simulating a rapid literacy transition

To capture changes in the proximate determinants and find the fastest possible adult literacy transition, I constructed a simulation model (Figure 8). It includes a cohort-component population projection, and stocks of the proportions of adults with primary education by age, and secondary by age. Population growth is determined by total fertility rates and age-specific death rates. Fertility can be influenced by literacy and lower fertility rates lower the school-age dependency ratio as the smaller birth cohorts reach school age. The model calculates adult education levels and school enrollment based on the internal dynamics that generate cohorts of potential and actual school-children, a pool of adults by education and teachers. Variables, such as cultural values, political commitment to education, population dispersion, are represented in constants that are changed exogenously in various simulations.

Secondary school enrollment (the source of teachers) is simply related to primary enrollment – it follows the latter with a 30-year delay, as observed in Figure 6 above. That delay itself is caused by a number of factors, among them the requirement to train enough secondary school teachers, and the simple fact that children enter secondary school at least 6 years later than primary (often more in developing countries).

Two basic feedback mechanisms govern the increase in primary school entry, and hence adult literacy. The most important is the teacher feedback mechanism. Teachers come out of the pool of adults with secondary education. Adults with secondary education are themselves the outcome of earlier primary, and (with a delay) secondary, school enrollment. Primary school enrollment is a function of the ratio of teachers to school age children and the actual pupil:teacher ratio, and, coming around the loop, the number of teachers is in turn determined by adults with secondary education. The second feedback mechanism is through fertility. This is a much weaker loop with regard to the education transition (although the mechanisms are important in many other social aspects). Primary school education raises adult literacy, which in turn reduces the net birth rate, slows population growth, and changes the age structure of the population. Slower growth means there are fewer school age children, both in absolute terms and in proportion to the adults who can teach them. This reduction of the school age to teacher ratio translates into higher primary school entry.

Because of the feedbacks, primary school entry and adult literacy are determined *internally* by the model, although the speed of the transitions are affected by the values of the exogenously set parameters.



**Figure 13. Model of school enrollment, adult literacy, teacher availability and population growth.**

## 7.1 Simulation results

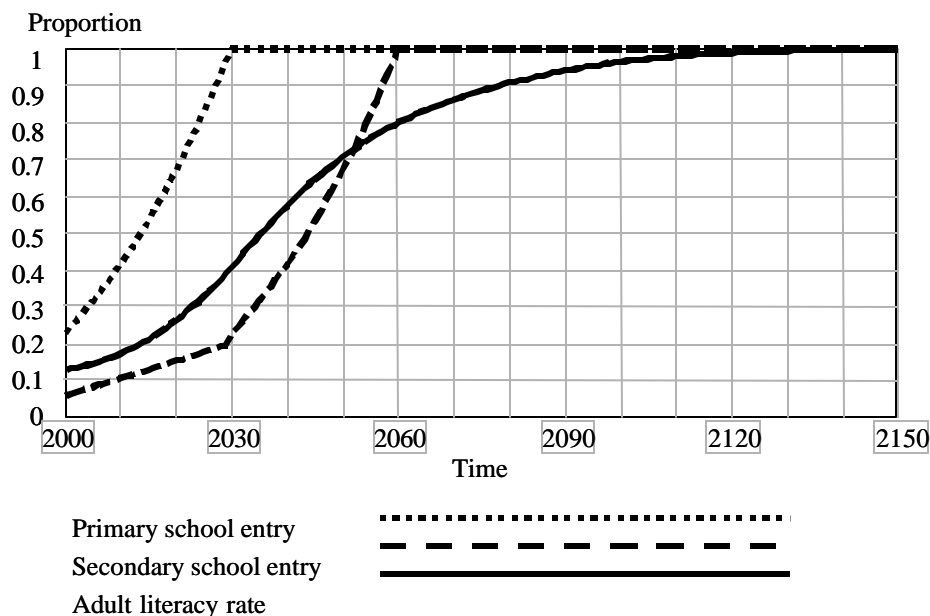
The purpose of the model is two-fold: first, to determine the maximum speed of the adult literacy transition imposed by the socio-demographic determinants, and second, to examine which factors are key to a slower or a faster transition.

To take a real example, we use Niger, one of the three countries – along with neighboring Burkina Faso and Mali – that is still at the very beginning of the education transition today. In 1996, the adult illiteracy rate was 86 percent. What is the most rapid possible transition to 90 percent adult literacy that Niger can achieve?

The values for the proximate determinants of Niger are all found in data available online. The pupil:teacher ratio in 1996 was 42; the proportion of adults with secondary education hired as teachers was 10 percent. These parameters are indicators of such things as public commitment to education, and ability of parents to send children to school. Only 2.8 percent of adults had secondary education, and the school age dependency ratio was .61. The total fertility rate, which is key to determining the school age dependency ratio, was 8 in 2000, and mortality rates were high. In 1996, a little less than one-third of the children entered and were in school (the apparent intake rate was 32, and gross enrollment was 29 percent), as would be expected from the proximate determinants.

In the base NIGER simulation, all of these parameters are held constant. Figure 14 shows primary school entry, secondary school entry, and the adult literacy rate together in one figure. According to the simulation, if the pupil:teacher ratios and the proportion of educated adults hired as teachers remained constant, Niger would achieve 90 percent primary school entry a little after 2025. Adult literacy lags behind primary school entry, and the full 90 percent literacy is not reached until 2080, meaning that with the parameters set as they are, Niger's education transition is slow. The reason for the long delay between

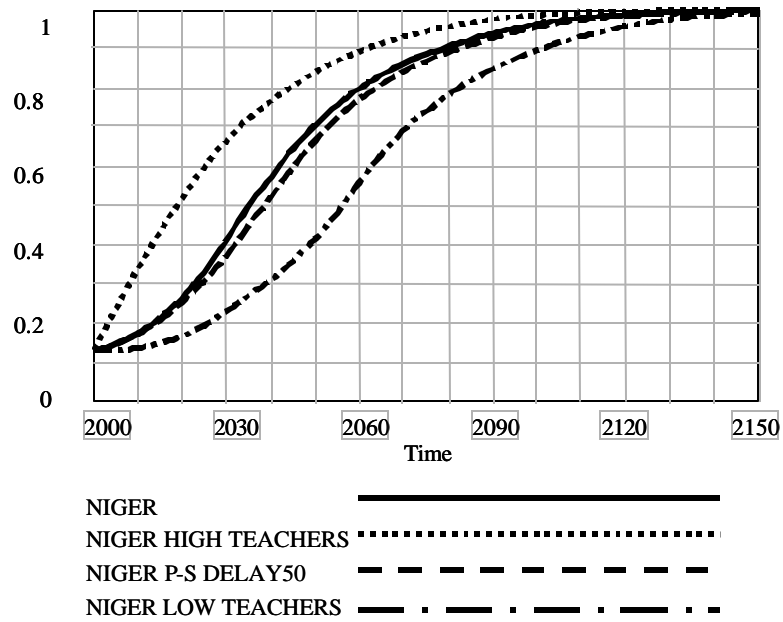
rising adult literacy and child school enrollment is due to the slow aging process – children must gradually mature and replace illiterate adults.



**Figure 14. Simulated primary school entry, secondary school entry, and adult literacy rate in Niger, from 2000-2150.**

To increase the speed of the transition to maximum, simulated in NIGER HIGH TEACHERS, Niger Could, in the short term, hire 25 % of the highly educated adults, and raise the pupil:teacher ratios to 70. In the theoretical case that such changes could be installed instantaneously, Niger's school entry rate would jump to 80 percent and within a decade, 90 percent of Niger's children would be going to school. In the case that such changes could occur, Niger would be able to achieve 90 percent adult literacy in 60 years. This is the fastest possible 10 to 90 percent literacy transition that can be achieved – relying on domestic teaching sources and child education alone. It can be shortened another 5-10 years with an aggressive adult education program once adult literacy reaches about 60 percent (the only successful adult literacy programs the authors found were in countries that already had a majority of literate adults, probably because of the resources necessary to teach and the time investment on the part of the adult pupils to learn to read). Conversely, hiring even fewer teachers, in the simulation called NIGER SLOW TEACHERS, say only 5 percent of the adults with secondary education, as Afghanistan in 1996, would delay 90 percent adult literacy by another 30 years, to 2010.

A parameter that does not have a large impact on the speed of the literacy transition is the lag between primary and secondary enrollment. In the three simulations above, the lag is set to 30 years. But there are some countries where the lag is as long as 50 years. If there were such a 50-year delay in Niger, then 90 percent adult literacy would be achieved only 5 years later than in the base NIGER case. The reason for this apparently counter-intuitive result is that adult with secondary education cease to be a limiting factor once about 10 percent of the adults have gone to secondary school.



**Figure 15. Simulated adult literacy rate in Niger, according to four assumptions regarding hiring of teachers, pupil:teacher ratio, and delay between primary and secondary school enrollment rises.**



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