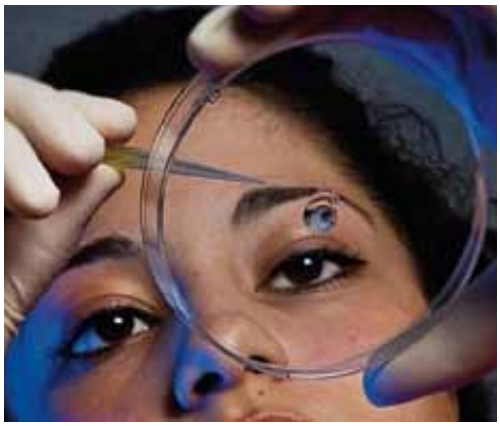
6



Enhancing Educational Futures

To be useful, a normative scenario of human development involves a stretch toward one or more meaningful goals.

Successive global meetings have set education targets (and repeatedly identified the goal of universal primary education) without taking into account the great differences in education participation rates that various countries had attained and therefore the distance they needed to travel to reach the goal in a specific target year. That goal-setting practice reflects the normative value the global community places on advancing participation in primary education, a value we strongly share. Yet establishing a common target year has, in essence, set some countries up to fail, and devoting so much attention to a single level of education has often diminished the amount of attention paid to other important levels. Our aim in this chapter is to develop—as an alternative to universal, fixed-horizon, single-level quantitative goals and as an alternative to the base case reviewed in the preceding chapter—a normative global education scenario that advances quantity and quality in an aggressive but realistic manner across multiple levels of education.

To be useful, any normative scenario of human development must combine two characteristics. First, it must involve stretching toward a meaningful goal or goals.[1] In this context, rather than identifying target dates for the attainment of specified enrollment rates, we identify aggressive annual advance in rates of participation; we similarly identify aggressive rates for closing gender gaps. Second, a normative education scenario must be attentive to feasibility. We should therefore consider the resource requirements for the education of each student at high levels of quality and efficiency, resource needs that can differ significantly across education levels and with the ongoing development of education systems and achievement of higher incomes.

Public resources are, of course, not the only foundation of feasibility. Clemens (2004) emphasized that, although education policy such as funding is important in helping

countries increase enrollment, broader development policy can be even more critical. Without encouragement from parents and family, sufficient economic well-being to provide the freedom to attend school, basic supportive systems such as transportation, and employment prospects in which to use education, an expansion of enrollment opportunities may simply prove inadequate. Although our analysis cannot explore foundational elements for 183 countries in such detail, we must be cognizant of such factors and avoid a presumption that education's advance is always feasible if only resources become available.

Another approach to building a normative scenario could have sought to maximize, in monetary terms, private and/or social returns on incremental investments in education, perhaps even specifying a precise extent of acceleration in education participation that would return the most value per unit of additional investment. We have not taken that approach for two major reasons. First, we do not believe that we can appropriately put monetary values on all the benefits of education, including either the value of personal human capabilities and improved quality of life (independent of income) or the range of social impacts, such as social stability, to which education may contribute. Second, we do not feel fully comfortable with our ability (or the ability of others) to so precisely specify the impact that education actually has on key variables such as social change.

Nonetheless, as a step toward addressing the reasonable expectation of any policy process that analysis will explicitly consider benefits relative to costs, Chapter 8 will explore the broader socioeconomic consequences of the normative scenario relative to the base case. We can directly compare the incremental expenditure requirements of the normative scenario with estimates of the higher GDP levels that such spending might generate. We can also explore the impacts that more education may have on broader sociopolitical outcomes, even if we hesitate to put monetary values on them. In summary, we wish to be both convinced and convincing that our normative scenario would improve human well-being relative to the base case. Our objective is to sketch a scenario of a better (as opposed to optimal) education future in order to contribute to the dialogue about education and broader human development policy directions.

Building a Normative Scenario

Our construction of a normative scenario begins with a consideration of points of leverage, not with the final goals typically set for education, such as universal primary enrollment. We also direct some special attention to the issue of quality in education, an arena in which it is much more complicated to identify the goals, points of leverage—although well-prepared teachers are certainly key—and specific targets than it is to address the quantity of education.

Points of leverage

Education goals often focus on enrollment rates, including the relative rates of females and males. Those actually seeking to increase enrollment rates, however, direct their attention to intake rates (or transition rates from lower levels of education) and to progress and persistence across grades, including survival to and completion of the final year of discrete levels of formal education. We do the same in the normative scenario.

From the perspective of education policy, of course, increases in intake/transition and in survival are by no means the most immediate points of leverage. One could, instead, drill down and begin to explore the implications of school fees or of transportation systems available to bring students to school. However, because of our extensive geographic and temporal coverage, we need to keep our focus at a high level with respect to intervention points.

In addition to intake/transition and survival, it is important that we take into account, at least at a highly aggregated level, the issue of resources. Again, one could drill down with a discussion of teacher salaries, class sizes, and much else. For our purposes, though, we will focus on aggregate expenditures per student, relative to GDP per capita, looking again for reasonable target levels within and across levels of education.

Cutting across and interacting with leverage points on intake or transition, survival, and spending is leverage with respect to quality. Quality is difficult to define and to measure. It is even more difficult to forecast. For those reasons, we do not identify specific targets with

At the same time, a useful normative scenario of human development is attentive to feasibility.

Our normative scenario is built around points of leverage: namely, intake and transition rates, survival rates, and resources.

Target rates of growth need to be sustainable on an integrated basis across education levels over extended periods.

respect to quality for the normative scenario, although we do consider the relationship between quality and a key variable in our forecasts, namely, survival rates.

Putting targets in context 1: Change across levels of education

Those seeking to improve education understand that the object of our attention is a set of complex systems—that is, the various aspects of education, including the progression of students across levels of education as well as the relationship between the numbers of students entering a level and those completing it, are interrelated and interactive. Thus, goal- or target-setting should not ignore the systemic, interactive character of these elements.

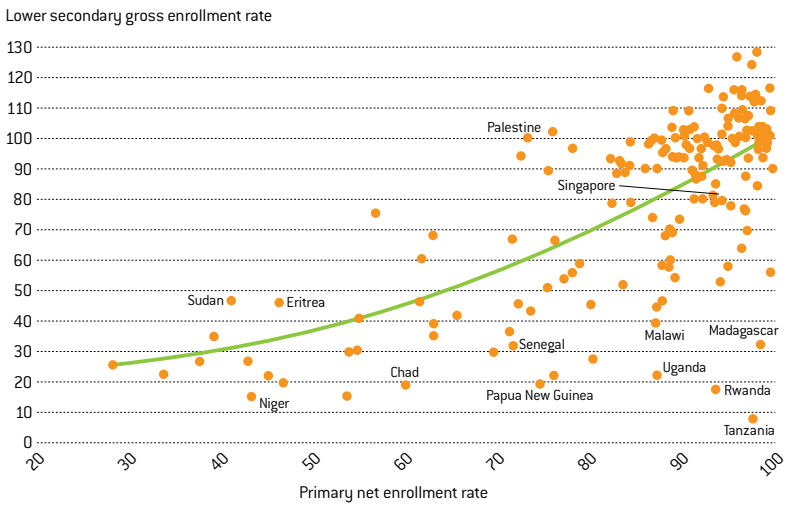
Somewhat in contrast to that perspective, Chapter 1 noted that the international community has set no global goals (with or without specific dates) for participation at postprimary levels, although we saw that there is substantial agreement on the importance of universal basic education (primary plus lower secondary), as well as having a "certain proportion" of a population completing the upper secondary level. And surely, some extent of tertiary education is essential for a country to have any chance of functioning as an equal partner in today's global, knowledge-based economy. We therefore extend our search for target rates of increase in intake/transition and survival through upper secondary education and want to take into account the interactions across levels, including tertiary education.

It is important that we look for patterns and specific targets that are sustainable on an integrated basis across education levels over the long haul, avoiding boom and bust cycles at any given level. Similarly, we need to take into account the natural relationships that exist across levels, including the pass-through of students from lower to higher levels. For example, increased numbers of primary graduates place great pressure on secondary systems. Given such pressure, should developing countries focus on completing the transition to universal primary education before addressing expansion of access to secondary education? What values, goals, and sets of circumstances should guide their decisions?

In fact, the balance of emphasis on primary and secondary education, and on lower and upper levels within secondary, varies considerably across countries. Figure 6.1 shows the global pattern of relationship between enrollments at the primary and lower secondary levels. Growth of lower secondary enrollment rates typically accelerates as primary enrollment moves toward universality. Figure 6.1 also identifies some of the countries that deviate considerably from the general pattern. Note, for example, that Uganda and Tanzania both have lower secondary gross enrollments near or below 20 percent in spite of primary net enrollments near 90 percent.

One could argue for the pattern of Uganda and Tanzania on the grounds of equity, emphasizing primary education for all rather than providing a path for a smaller number to achieve both primary and secondary education and thereby leaving many citizens behind (as might be argued is the case for Sudan and Eritrea in Figure 6.1). But it is important to recognize that moving toward universal primary enrollment without building a significant secondary system as well might be inefficient. For instance, good training for teachers and therefore a high quality of primary education requires that teachers have at least a secondary education. It is not a coincidence that many of

Figure 6.1 Balance: Relationship of lower secondary gross to primary net enrollment rates



Note: Republic of Congo was excluded as an extreme outlier. Equation: $y = 15.1713 + .00858\ x^2$; R-squared = 0.43

Source: IFs Version 6.12 using UIS data (most recent by country).

the countries below the line in Figure 6.1 suffer low survival rates relative to intake rates, as shown later in Figure 6.2. Students and their families may not continue the educational process if the quality of it does not provide benefits greater than the opportunity costs of the pursuit.

The reality is that multiple interaction and threshold effects link enrollments across levels of education. For example, Figure 6.1 suggests there is an accelerated takeoff in lower secondary gross enrollment rates when primary net enrollment exceeds about 80 percent. More generally, there is an upward-sloping relationship between enrollment rates across sequential levels of education. Part of this is simply a pass-through effect—enrollments at higher levels build on increasing numbers of graduates at lower levels. Part of it is an attention and resource availability effect—as enrollments begin to saturate at one level, growth accelerates at the next. For example, Cuadra and Moreno (2005) noted that global rates of growth at the secondary level now exceed those at the primary level. Mingat (2004: 7) similarly emphasized that the anticipated growth in number of those completing primary school from 7.8 million in 2001 to 20.7 million in 2015 will create great bottom-up pressure for growth at the secondary level.

Relevant to the issue of attention and resource availability—and seemingly contrary to the argument that there are trade-off and sequencing effects—Lewin (2004: 23) concluded that "enrolment rates at the secondary level in SSA are substantially independent of primary enrolment levels" and instead reflect policy preferences. Yet clearly, the pressures of Education for All and the MDG for universal primary education have been channeling especially large contemporary efforts to the primary level and, at least in some countries, therefore starving secondary education. Both trade-offs among levels and sequencing across them seem inevitable.

We argue, throughout this volume, that there is no one "right way" to proceed with the development of education systems across multiple levels of education. Still, the normative scenario that we elaborate must minimally be attentive to the relationships across the levels.

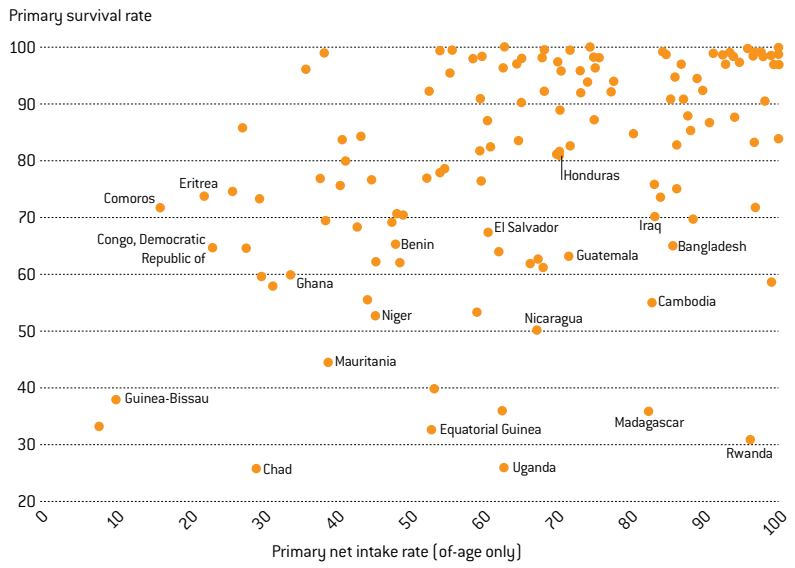
Putting targets in context 2: Change within levels of education

There are also interaction and threshold effects within each level of education. With respect to interaction effects, rapid growth in intake/transition often results in decreasing survival rates as the desire to educate more students overwhelms the ability to do so well or because additional entering students (for example, those who are in the first generation of family members attending school) face especially daunting challenges.

More generally, Figure 6.2 shows the global relationship of survival rate to intake rate. Different groupings of countries in the figure illustrate different challenges to education systems. For example, countries below 70–80 percent survival may be considered to suffer inefficiency because students who enter, and upon whom resources are spent, do not complete a full academic program. Countries in the lower right-hand quadrant of the figure, such as Equatorial Guinea, Madagascar, Rwanda, and Uganda, bring most of-age students into the system but advance relatively few of them to graduation.[2] A second set of countries in Figure 6.2, including Benin, Comoros, Eritrea, the Democratic Republic of Congo, and Ghana, illustrate a different kind of education system

Targets also need to be sustainable within levels; if targeted growth rates in intake are too high, survival rates are likely to decline.

Figure 6.2 Efficiency: Primary survival rate across levels of of-age intake rate



Source: IFs Version 6.12 using UIS data (most recent by country).

challenge. These countries have moderately high survival rates, but their intake rates are far from universal and are therefore inherently inequitable. In the lower left-hand quadrant of the figure, Guinea-Bissau, Chad, and Mauritania struggle with a double burden—low intake and low survival rates.

A critical question that emerges from this analysis is how developing countries deal with the twin and interacting challenges of equity and efficiency as they move toward universal primary education. Do they tend to deal with both challenges simultaneously, or is there a pattern of emphasizing first one target and then the other? What are the circumstances and consequences associated with the differing patterns, and are there implications for best practice?

Advancing global education requires a focus on quality, not just quantity.

Moving from the issue of challenges that countries face to the challenges of developing a normative scenario, the complex relationship between growth of intake (or transition) and survival must make us cautious about what is possible in the attempt to set generalized and basically independent target rates of growth for them. Setting such targets may be a significant step forward from setting universal enrollment goals with the same target date for all countries. Yet our approach of setting targets for growth in intake or transition and survival rates quite independently of each other has its own significant weaknesses, and we view our effort as a step in a longer and larger process. A better approach would be more algorithmic, specifying relationships (codifying interaction and threshold effects) as well as target rates. Such algorithms would take into account not just the immediate or direct relationship between intake or transition and survival; they would also be sensitive to the impact on both of system drivers such as demographic and economic change.

Unfortunately, only proxy measures are widely available as comparative indicators of quality.

An algorithmic approach, of course, is exactly what the IFs education model (see, again, Chapter 4) attempts to use more generally—for instance, as enrollments begin to saturate at the primary level, the model automatically shifts resources to the higher levels. Yet the model and our specification of normative targets have many remaining weaknesses in this respect, including this absence of a structure for handling interaction effects between intake and survival.

Beyond the combination of targets and more comprehensive algorithmic representations, a normative analysis would benefit as well from adding a more extensive country-specific analysis. Countries not only start from unique points determined by historical paths as represented in IFs but also vary in their philosophies and goals, including how to resolve issues related to the trade-off between the portion of the population to be educated and the extent of education provided for those who enter the system.

An elephant in the target-setting room: Assessing quality

The final goal of the Dakar Framework reminds us explicitly that extending the quantity of education, though essential, is not sufficient. In addition, advancing global education requires a focus on "improving all aspects of the quality of education and ensuring excellence of all so that recognized and measurable learning outcomes are achieved by all, especially in literacy, numeracy, and essential life skills" (UNESCO 2000: 2). To improve quality, it is necessary first to develop measures of it, second to assess performance by applying those measures, and third to analyze and implement approaches to its enhancement.

Many developed countries now participate in international learning assessments (see Box 6.1) that focus specifically on literacy, numeracy, and/or essential life skills.[3] Unfortunately, far from all middle-income countries and very few low-income countries have participated to date. For instance, in sub-Saharan Africa, only Botswana, Ghana, and South Africa took part in any of the standardized multinational assessments through 2007.[4]

Because relatively few developing countries have yet to participate in international standardized learning assessments, analyses often use more widely available proxy measures as comparative indicators of quality. The most frequently used measure is one of the official indicators for the universal primary education MDG, namely, the survival rate of an entering primary cohort to the beginning of the fifth or final grade (discussed earlier as a measure of efficiency but also having an equity component). The use of the survival rate as a quality proxy is based on the presumption that schools, in general, will not retain large proportions of students to the final grade unless the education

Box 6.1 The development of international educational assessment

The International Association for the Evaluation of Educational Achievement (IEA) and the OECD are each involved in significant efforts to measure educational quality across countries, and both focus on direct assessment of student learning outcomes rather than on proxy measures.

The two primary IEA assessments, conducted in conjunction with the International Study Center at Boston College's Lynch School of Education, are TIMSS (Trends in Math and Science Study) and PIRLS (Progress in International Reading Literacy Study). TIMSS was conducted in 1995, 1999, 2003, and 2007; all four assessments included eighth-grade students, and all but the 1999 assessment included fourth-grade students. The 1995 assessment also included students in the final grade of secondary school. PIRLS was conducted in 2001 and 2006, both times with fourth-grade students only. Every participating country's performance on each of the tests is reported relative to an international mean score across all participating countries. TIMSS and PIRLS reporting also includes the percentage of students in each country who performed at percentile levels of achievement relative to defined competency levels or targets.

The PISA assessment program—under the auspices of the OECD—focuses on fifteen-year-olds. PISA—the Programme for International Student Assessment—includes timed tests in reading, mathematics, and science literacy. It assesses student ability to apply knowledge and learning at the "typical" end of compulsory education. PISA was conducted in 2000, 2003, and 2006. PISA expresses performance scores as country-level means and standard errors, and it includes percentile distributions. Because many children in developing countries are no longer in the educational system by age fifteen, PISA cannot provide as broad an assessment of the quality of primary education as do TIMSS and PIRLS. Instead, its focus is on assessing preparation for assuming the roles and responsibilities of work, citizenship, and/or advanced study for those who are completing lower secondary or basic education.

experience has quality. Testifying further to the importance of survival rate, the Education Development Index (EDI), developed to measure overall progress toward a number of the goals in the Dakar Framework (UNESCO 2007b: 198–205), relies upon survival as the quality component.[5]

Analysis with the IFs modeling system directly compared the scores of countries on the various examinations and found high correlations across them (see the Appendix to this chapter). It also found that the survival rate correlated highly with assessment results across countries, even after controlling for levels of GDP per capita and of income distribution. Forecasting results on international assessments is not possible in the IFs system at this time because we currently have no structural foundation for it. It is, however, possible to analyze and forecast survival rates. In addition to its direct importance for both equity and efficiency, the normative scenario will therefore give survival attention as a possible measure of quality.

Identifying Targets: Intake/Transition and Survival

The normative scenario requires a quantitative specification of aggressive but reasonable intake rates at the primary level (or transition rates at higher levels of education) and survival rates to the end of studies. Here, we will consider how fast those rates can realistically grow at primary, lower secondary, and upper secondary levels before returning in the next section to the issue of appropriate expenditures per student. The focus here is on annual percentage point changes in rates—for example, a 2 percentage point increase in the primary intake rate might take it from 64 to 66 percent.[6] We are interested also, of course, in specifying how fast gender gaps can close.

We looked to many sources for help in quantifying aggressive but reasonable rates of growth in intake, transition, and survival.

Data and information streams for setting targets

Given the methodological complications of analysis concerning good practice in education's growth, variations in education systems, and the underlying societal value configurations they reflect, there is no completely satisfactory way in which to set general targets for rates of growth in intake/transition and survival. The fundamentally qualitative exercise needs to have elements of a Bayesian analysis that uses multiple streams of information to gradually shape and reshape judgments about reasonable targets.[7] The streams help us develop an understanding of typical and also of especially good experiences in educational growth.

Existing studies

Prior studies and analyses provide one stream of information. With respect to primary enrollment

rates, as discussed before, Clemens (2004: 15–16) found that in the last half of the twentieth century, countries on the average moved from 50 percent primary net enrollment to 70 percent in 22.3 years, increasing enrollment rates by nearly 1 percentage point each year; movement from 75 to 90 percent enrollment took 28 years on average, at a rate of approximately 0.5 percentage points each year. Similarly, Wils, Carrol, and Barrow (2005: 22) found that movement from 80 to 90 percent required 14.7 years, a gain of about 0.7 percentage points each year. (See, again, Chapter 5 for a comparison of the forecasts of IFs in the base case with these historical analyses.)

Data-rich countries

Another stream of information, particularly with respect to common experience if not necessarily best practice, comes from an analysis of the history of especially data-rich countries. In our supporting analysis, we examined the experience of the thirty-two countries globally with the most complete data since 1999 on intake/survival and transition rates across primary, lower secondary, and upper secondary levels. All are developing countries.

The collective examination of these countries helped us draw several conclusions. First, it is extremely difficult to make progress across intake/transition and survival rates at all levels of education simultaneously. Almost all countries have made progress in some areas while losing ground in others. Second, the recent attention to the primary level has been very aggressive, almost certainly at the expense of other levels. Third and relatedly, countries that have been attentive to the primary level but somewhat less aggressive with respect to it appear to have demonstrated greater progress at higher levels and more balanced progress overall. The general conclusion that we draw from this analysis is that we must be careful not to let very rapid progress on any single or small set of variables suggest target values for the normative scenario; instead, we looked for target values that would support a strategy of balanced educational advance.

High-growth countries

Still another evidence stream is the analysis of rapid-growth countries. With respect to primary completion rates, Bruns, Mingat, and Rakotomalala (2003) found that the twenty highest-performing low-income countries during the 1990s achieved, on average, a 2.38 percentage point annual increase in completion rates.[8] Completion rates (the portion of potential students who finish a level of education) climb as roughly the sum of increase in intake rates (the portion of potential students who enter) and survival rates to the last grade for those who enter. The IFs historical series indicates that intake increased 1.5 to 2.0 percentage points annually in that set of countries. Thus, the implicit gain in survival rates for those countries would have been about 0.38 to 0.88 points, or a less than 1 percentage point annual increase. Such evidence suggests that 1 percentage point in annual growth is an aggressive target for primary survival rate changes, especially on top of growing intake rates.

In our own analysis, we looked at the twelve countries with the most rapid growth in recent years (within the 1999–2005 range) for each of the target variables. Many of those countries have been experiencing catch-up or overshoot, so they need to be considered carefully, not simply used to set target rates. To put the analysis of fast growth in a longer historical context, Botswana appeared successful after 1970 in raising primary net enrollment rates from 46 to 76 percent in 10 years, an annual increase of nearly 3 percentage points. Those numbers may, however, have been overly ambitious or inaccurate and then corrected; over a full 35 years (1970–2005), the annual increase was only about 1 percentage point (46–84 percent). Similarly, Bangladesh appeared to have surged from 50 to 90 percent in 28 years (adding an average of 1.4 percentage points annually), but over a full 35 years, the annual increase averaged 1.1 percentage points.

In short, fast growth is very often not sustainable—and again, it may come at the expense of other education levels. Nonetheless, looking especially at the countries near the bottom of the set of twelve (and thereby eliminating the clear outliers at the upper end) gave us some additional sense of what good target rates might be. Moreover, looking within the sets of both data-rich and high-growth countries helped us identify the points on each variable at which growth appears most rapid. This is important because of the S-shaped pattern of such growth across the entire range of each variable.

We gave special attention to selected countries. For instance, Lesotho (both a data-rich and a high-growth country) experienced in recent years an annual growth of 4.2 percentage points in primary intake, 0.6 percentage point in primary survival, 2.6 percentage points in transition to lower secondary, –.1 percentage point in lower secondary survival, 1.5 percentage points in transition to upper secondary general programs, and 1.1 percentage points in survival in upper secondary general programs. Such a relatively balanced pattern of growth begins to suggest one integrated set of normative targets. Yet Lesotho, like all countries, is unique in many aspects. In addition to having experienced its own sociopolitical turmoil in 1998, just before this period of growth, its close ties to the economic and sociopolitical systems of South Africa have transmitted many beneficial effects to it from the dismantling of apartheid there in the 1990–1993 period. In short, its analysis provides more information but not conclusive suggestions for target rates.

We have similarly looked at a set of countries that experienced an especially rapid narrowing of gender gaps over the 1980–2005 period, including Benin, Burkina Faso, Ethiopia, Guinea, India, and Nepal (and also Botswana and Lesotho with the closure of male gender gaps). They have changed gender ratios toward parity by about 0.01 to 0.02 points (on a scale where 1.0 is exact parity) per year on average.

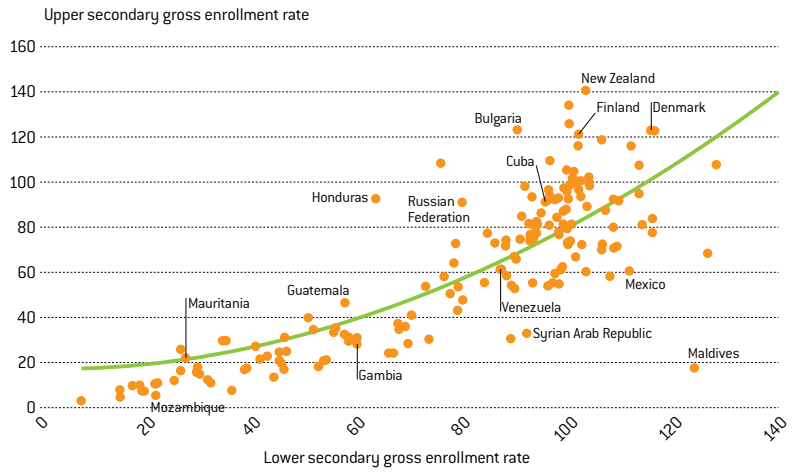
Problem countries

Another place to look for insight is in sets of problem countries. With respect to gender parity, Afghanistan is consistently among the absolute worst performers, although it is likely that data for the country have not caught up with some of the improvements in the society since 2001. Setting Afghanistan aside, other countries with primary gender parity ratios below 0.8 in 2005 were Burkina Faso, the Central African Republic, Chad, Guinea-Bissau, Liberia, Mali, Niger, Pakistan, Somalia, and Yemen. Additional countries below 0.9 were Benin, Comoros, Democratic Republic of Congo, Côte d'Ivoire, Djibouti, Eritrea, Guinea, Iraq, Nepal, Nigeria, Sierra Leone, Sudan, and Togo. Simply to name these countries is to recognize how difficult the process of change will be; many fall regularly on lists of conflict-ridden or failed states, and substantial numbers also have cultural traditions that have disadvantaged women. Creating a normative scenario for rates of change in such countries should not excuse slow growth with attention to such deeper problems, but we should recognize that rapid progress across the set is improbable and again temper our expectations accordingly.

Cross-sectional analysis

The analysis of relationships between normative target variables by using data from all reporting countries also can be helpful, especially with respect to thinking systemically about the normative scenario. Figure 6.1 showed the general pattern of progression from primary to lower secondary enrollments. Figure 6.3 similarly shows how countries tend to balance lower and upper secondary enrollment rates in general secondary programs and, generalizing from the cross-sectional pattern to longitudinal underpinnings, how increases at the upper secondary level accelerate with higher levels of lower secondary enrollment. As a variant on Figure 6.3, we also explored fairly extensively the relationships over time between average annual changes in the target variables (namely, transition rates and survival rates).

Figure 6.3 Upper secondary gross enrollment rate as function of lower secondary gross enrollment rate



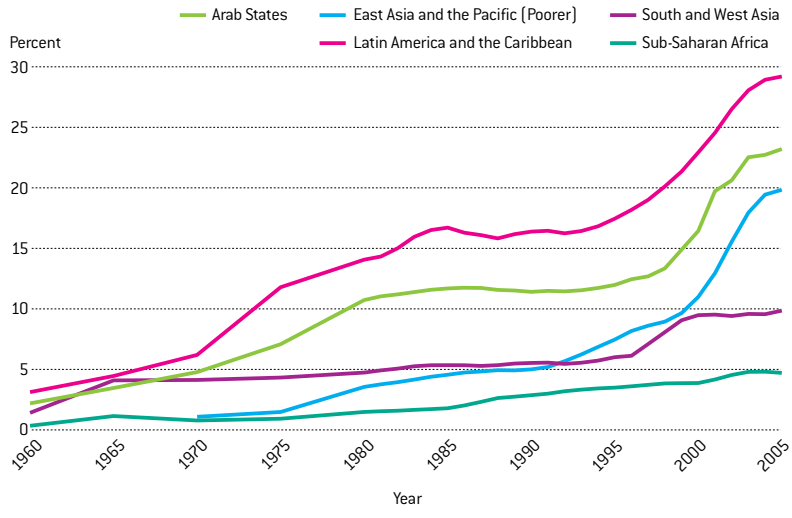
Note: Australia was excluded as an extreme outlier because it included large numbers of postsecondary students returning for adult vocational education. Equation: $y = 16.8549 + .00625\ x^2$; R-squared = 0.55

Source: IFs Version 6.12 using UIS data (most recent by country).

Regional and country grouping analysis

Still another stream of information comes from looking at regional patterns over time, allowing some aggregation and averaging of idiosyncratic country patterns. We looked, for instance, at the regional growth of enrollment rates at each level of education across time, to obtain a sense of periods in which enrollment grew especially rapidly and the rates it was able to reach and sustain. As an example, Figure 6.4 shows the pattern of growth in tertiary enrollment rates for selected developing regions. In the middle to late 1990s, three regions obviously reached thresholds or turning points, followed by much-accelerated tertiary enrollment growth. In the subperiod from 1998 through 2004, the enrollment rate in Latin America and the Caribbean and in the Arab States rose by about 1.6–1.8 percentage points annually. In that same subperiod, enrollments in developing East Asia and the Pacific rose just over 2.0 percentage points annually. All these regions had reached upper secondary gross enrollment rates of about 40 percent by the beginning of their recent tertiary rapid-growth spurts (Latin America had reached 63 percent), reinforcing the pattern found at lower education levels in regard to the need to build a foundation prior to making rapid gains at the next level. These levels are, however, lower than the 70–80 percent or so found in an analysis of thresholds for spillover at lower levels. It is possible that, with accelerated globalization, recognition of the importance of higher education for global knowledge economies and societies spread rapidly in the 1990s, giving an additional impetus to higher education everywhere.

Figure 6.4 Tertiary gross enrollment rates in selected developing regions (1960–2005)



Note: Values are 5-year moving averages because of transients in sets of countries with variable reporting across time. For the same reason, the following data were excluded: 1999 from the Arab States, 1960 and 1965 from East Asia and the Pacific, and 1998 from South and West Asia.

Source: IFs Version 6.12 using UIS data.

Analysis of dynamics across levels of education

Finally, we needed to devote special attention, especially for gender parity, to the dynamics of enrollment flows over time and to explore implications of the pass-through of students from one level of education to another. Chapter 3 discussed the fact that gender imbalances in favor of males tend progressively to become less pronounced and even to reverse at higher levels of education. Interestingly, situations can arise, such as those in Egypt or Morocco, in which the transition and survival rates in upper secondary general programs are both higher for females than for males despite the fact that the overall upper secondary enrollment ratios definitively favor males.

A major reason for this seeming anomaly is that males have higher primary entry and enrollment rates than females in these countries and consequently are more "available" to pass through to higher levels. Another is that males have higher participation rates in vocational secondary programs in these countries. Thus, even though a higher percentage of the females who complete the primary level and/or lower secondary levels go on to upper secondary general programs, and even though more females than males who begin upper secondary general programs complete them, there are more males enrolled at the upper secondary level overall. The leverage points of our normative scenario at secondary levels are transition and survival rates for general secondary programs, but it is not at all clear that simply moving those rates toward greater gender equality enhances true parity at the upper secondary level.

Overall, the most aggressive action with respect to gender parity needs to begin with intake rates at the lowest level and gradually push parity through to the higher levels, while

still not ignoring the disadvantaged gender (whichever that may be) at each step along the way. Thus, for normative targets, we set the highest annual percentage movements toward gender parity at the primary level (1 percentage point) and progressively lower ones at the secondary levels. Our normative scenario also moves secondary vocational enrollment rates toward parity. At the tertiary level, we slowly move gender ratios to 1.0 beyond the 2060 forecast horizon.

Conclusions for the normative scenario: Student flows

Despite our efforts to use data heavily, the process of creating the normative scenario was a significantly qualitative one. It had an iterative character, beginning with some initial estimates for reasonable targets that we gradually adjusted in light of new evidence streams. The scenario does not include target specifications at the tertiary level except for slow reductions of gender imbalances because we did not feel our basis for them was strong enough yet. Table 6.1 summarizes the target values for intake/transition, survival, and gender parity at all levels of education that we used in the normative scenario. The target values specify maximum growth rates that occur near the midrange of intake/transition and survival. Because of constraints on growth of those variables at the low end of ranges (related to difficulty in scaling up systems) and at the high end of ranges (related to complications in bringing in the last portions of populations), we applied S-curve patterns of growth around those maximum values.

The gender parity targets augment the targets for intake/transition and survival. Thus, for example, intake rates for the disadvantaged gender at the primary level, almost always girls, could conceivably be increased by as much as the sum of 2.2 percentage points for the intake effect itself plus 1.0 percentage point for the gender gap closure effect.

Throughout this volume, the discussion of change in patterns of student flows has made it clear that if one were creating a normative scenario for a particular region or country, the setting of targets for growth such as those in Table 6.1 would be helpful but ultimately inadequate and in need of further tailoring. Countries pursue such targets in very specific demographic, economic, and sociopolitical contexts. Normative scenarios, when taken to the level of planning, should recognize that countries begin at markedly different places, honor those differences, and not force cookie-cutter uniformity on countries. For this global analysis, however, the general specification of rates is necessary and reasonable.

In the IFs base case of Chapter 5, budgetary constraints were of great importance. Although we lift those constraints for purposes of analysis in the normative scenario, spending patterns remain a fundamental concern. Further elaboration of the normative scenario requires that we turn to a consideration of per-student spending.

Our normative student flow targets were developed iteratively as we reviewed data and applied qualitative judgments to the many evidence streams.

Table 6.1 Summary of target rates in the normative scenario

	Intake/transition	Survival	Gender parity
Primary	2.2 percentage point annual increase	1.2 percentage point annual increase (2 percentage points could be reasonable for some countries in catch-up mode, especially above 65 percent survival)	1.0 percentage point (0.01) annual closure in parity ratios for both intake and survival
Lower secondary	1.0 percentage point annual increase (has compounding effect on top of primary growth)	0.8 percentage point annual increase	0.8 percentage point (0.008) annual closure in parity ratios for both transition and survival
Upper secondary	0.5 percentage point annual increase (historically, this would ramp up with increased lower secondary enrollment)	0.3 percentage point annual increase (country or regional catch-up specifications could be as much as 2 points, e.g., in South and West Asia)	0.5 percentage point (0.005) annual closure in parity ratios for both transition and survival
Tertiary	Normative scenario does not change this (2 percentage points growth in gross enrollment would be aggressive)	Normative scenario does not change this (2 percentage points growth in gross enrollment would be aggressive)	Normative scenario slowly moves gender ratios to 1.0 (beyond forecast horizon)

Note: Maximum values are at 50 percent intake/transition and 65 percent survival with relative slowing at higher and lower levels, generating an S-shaped curve of growth.

Source: Compiled by the authors.

Similarly, we explored multiple sources of information about spending patterns in order to build normative spending targets at each education level.

Identifying Targets: Public Spending per Student

To establish a context for thinking about spending on education, Table 6.2 shows how public spending per student varies around the world and by level of education. As UNESCO (2007a: 19) pointed out, "By expressing expenditure [per student] as a percentage of GDP per capita, education budgets can be compared in relation to national income level, which is a proxy for a country's ability to generate education financing."

At the primary and lower secondary levels, low-income and lower middle-income countries spend considerably less per student as a percentage of GDP per capita than upper middle-income and high-income countries do. It may be reasonable to speculate that such levels for lower-income countries represent inadequate spending as a result of resource constraints and high child dependency ratios. In contrast, however, low-income countries spend much more per student at the upper secondary and especially at the tertiary level than do richer countries. That almost certainly reflects the great difficulty that the poorest countries have in obtaining educated faculty and other professionals to staff higher education, and it may also represent the start-up costs of developing facilities for universities and professional schools. In addition, on the basis of limited available data, it appears that in richer countries, private expenditures at the tertiary level facilitate lower public expenditure rates.[9] Also, education at the tertiary level is a more tradable good than education at lower levels (large numbers of students do study abroad), a fact that could lead to some degree of global convergence in actual costs and prices and therefore to continued disparity in spending relative to GDP per capita.

There is, however, tremendous variation in spending rates per student across countries within the categories of Table 6.2, especially those at lower income levels. To determine "reasonable" spending rates for a normative scenario, it would be most useful to identify benchmarks that represent spending consistent with the goals of both quality and efficiency. Two approaches can help us estimate such benchmarks for per-student costs relative to GDP per capita, appropriate to the economic development level of each country and variable across levels of education. The first is a bottom-up analysis of specific costs within developing countries that illustrate good practice in expanding education participation and attainment. The second is an aggregate, top-down analysis, looking comparatively at total spending across countries around the world to understand how patterns relate to quantity and quality of performance.

Table 6.2 Public spending per student as percent of GDP per capita at PPP by country income level

	Country income level			
Education level	**Low**	**Lower middle**	**Upper middle**	**High**
Primary	11.2	8.5	15.3	19.8
Lower secondary	20.1	8.9	15.3	23.5
Upper secondary	50.1	21.3	16.2	25.9
Tertiary	225.9	64.8	31.4	28.7

Note: Countries are grouped by World Bank economy classifications.

Source: IFs Version 6.12 using UIS data (most recent by country).

Good practice: A bottom-up look

Many analyses of global education have identified, at least conceptually, the kinds of specific inputs that quantity expansion and quality improvement require, including well-trained teachers, sufficient teaching materials, safe and accessible schools, and supporting infrastructure. The costs of such inputs vary greatly across countries, reflecting differing cost structures and expenditure capacities as well as historical paths and unique circumstances. Yet salaries, which constitute about 75 percent of total costs globally for preprimary through upper secondary education,[10] correlate highly around the world with GDP per capita. Other costs also covary with GDP per capita, which is why per-student spending as a percentage of GDP per capita is a useful focus of analysis.

The landmark study conducted by Bruns, Mingat, and Rakotomalala (2003) exemplifies useful bottom-up analysis at the primary level.[11] Their study grouped 47 of the low-income countries eligible to receive deeply concessional funds from the World Bank's International Development Association (IDA) into four categories, dependent on their success in expanding education participation.

- Group 1 (relative EFA success) countries: These 10 countries had gross primary enrollment rates of at least 85 percent and primary completion rates of 70 percent or more. They also had "healthy spending; reasonable unit costs, teacher salaries, and class size; and low repetition" (p. 63).
- Group 2 (high inefficiency) countries: These 8 countries had gross enrollment rates of at least 80 percent but completion rates of 60 percent or less. The report's stylized description of their education systems was "inadequate spending on quality and excessive repetition" (p. 64).
- Group 3 (low coverage) countries: These 7 had both gross enrollment and primary completion rates of 60 percent or less and were characterized by "low spending, high unit costs driven by extremely high teacher salaries, and relatively poor efficiency" (p. 64).
- Group 4 countries: These 24 countries fell outside the defined patterns of Groups 1–3.

By analyzing the system characteristics associated with success, notably in Group 1, Bruns, Mingat, and Rakotomalala (2003: 73) constructed stylized best-practice benchmarks related to quality, efficiency, and resource mobilization and use. Benchmarks included forty pupils per teacher, 33.3 percent spending on inputs other than teachers, a 3.5 multiple of GDP per capita for average teacher salaries, and a 10 percent repetition rate (reflected in a 110 percent target for the gross enrollment rate).[12] Guidelines (the Indicative Framework) for countries selected into the Fast Track Initiative use these benchmarks, with an addition for instructional hours per year.

Overall, the work of Bruns, Mingat, and Rakotomalala (2003) suggested that best-practice spending at the primary level is about 2 percent of GDP per capita more than the average spending levels of their Group 1 countries (that is, 14 percent of GDP per capita versus the average of 11.8 percent in Group 1). That is an important insight as we move to looking from a top-down instead of bottom-up perspective.[13]

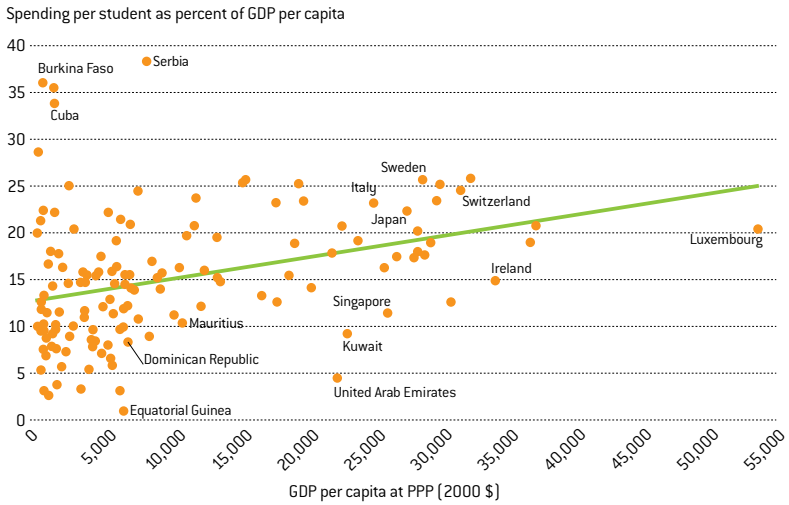
Good practice: Aggregate, top-down analysis

Aggregate, cross-sectional comparisons can provide a more detailed picture of spending per student as it relates to income levels (see, again, the summary picture in Table 6.2). They also show the extent of variability in spending patterns and serve as a takeoff point for an exploration of that variability. For these reasons, we use them to frame our top-down analysis.

Primary-level public spending

Figure 6.5 shows the global relationship for both developing and developed countries between GDP per capita and primary spending per student as a percent of GDP per capita. The range of spending practices around the central tendency in Figure 6.5 is dramatic for low-income countries. Some of the more extreme values are likely the result of data problems. Still, there are also many reasons for the substantial spread. Cuba, for instance, prides itself on its public investments in human capital. Some other countries well above the line have high cost structures because of teacher shortages—for example, Bruns, Mingat, and Rakotomalala (2003: 146) reported that teacher salaries in Burkina Faso were eight times GDP per capita. Other countries suffer from the disappearance of funds into many pockets as funds move from central authorities to local school officials; in fact, the addition of Transparency International's measure of corruption perception to the relationship in Figure 6.5 raises the adjusted R-squared from

Figure 6.5 Primary spending per student as function of GDP per capita at PPP



Note: Djibouti was excluded as an extreme outlier. Equation: y = 12.5430 + .000228 x; R-squared = 0.12

Source: IFs Version 6.12 using UIS and WDI data (most recent by country).

0.12 to 0.17. Some of the countries well below the line rely heavily on private spending; for example, in the Dominican Republic, private funding for primary education is about 0.5 percent of GDP. More generally, developing countries are going up steep learning curves as they structure, institutionalize, and in many cases reform their education systems.

The upward-sloping line of Figure 6.5 captures the same tendency that Table 6.2 showed—namely, that at the primary level, higher-income countries spend a greater portion of GDP per capita on each student. The central tendency of primary spending per student in countries with GDP per capita below $5,000 is in the general range of 13–14 percent (including capital expenditures).[14] Interestingly, the regression line in Figure 6.5 thus fits the benchmark values that Bruns, Mingat, and Rakotomalala (2003) identified from a bottom-up analysis. These analytical elements together suggest that our normative scenario might productively target spending levels at about those of the relationship in Figure 6.5.[15]

Total secondary-level public spending

Turning to spending at the aggregate secondary level, a similar cross-sectional analysis (not shown) produces a central tendency for global spending of about 22 percent of GDP per capita. Cuadra and Moreno (2005: xxii) argued that successful secondary systems have been spending 1.4 times as much per secondary student as they do per primary student (and 3 times as much per tertiary student). If good-practice spending at the primary level is in the range of 13–15 percent of GDP per capita, that would imply that secondary spending should be in the range of 18–21 percent, just slightly below the global average, a fact that reinforces our general approach of using global cross-sectional patterns as proxies for good practice.[16]

Binder (2006) considered the costs of good practice at the secondary level in an analysis of 144 developing countries. Using net enrollment rate as a measure of quality, she found that "the median high-performing country achieves better outcomes at a lower per unit cost than the average country" (Binder 2006: 473). We should certainly not interpret this result to mean that lower spending is always better, but it does suggest that some high-spending countries are inefficient and that factors beyond expenditure per student are critical to performance. In any case, it, too, adds support to our attention to central tendencies of spending rather than values above them.

Secondary-level public spending: Differentiating lower and upper levels

As we noted in earlier chapters, the main thrust of the distinction between lower and upper secondary education holds that lower secondary education is the completion of basic education whereas upper secondary education provides more specific and specialized preparation for work or advanced study. Elaboration of this distinction usually makes the point that the cost structure for lower secondary education is, or could be, quite similar to that of primary education, especially if teachers and physical facilities are shared. Meanwhile, upper secondary education, because of its more specialized and diversified nature, is—or is likely to be—more expensive.

Table 6.2 showed the general tendency for spending per student at the lower secondary level to rise with income. The table also showed spending per student at the upper secondary level to be especially high for low-income countries, lower in the middle range, and then rising somewhat with high GDP per capita (a U-shaped pattern). In extended cross-sectional analysis at the lower secondary level, the correlation of GDP per capita with per-student spending is nearly nonexistent, and the pattern is nearly flat, with a central tendency globally of around 20 percent.

The relationship between GDP per capita and per-student spending at the upper secondary level (see Figure 6.6) is downward-sloping from the low-income to middle-income range. As we move attention to the high-income end of the range, however, the spending per student as a portion of GDP per capita is generally flat, with a slight tendency (as shown in Table 6.2) for some upward movement.

Tertiary-level spending

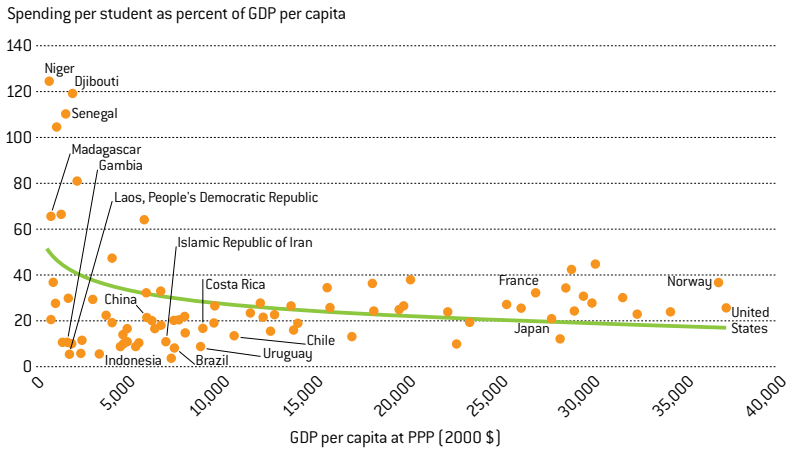
Turning to spending at the tertiary level, Figure 6.7 shows that the range across developing countries of spending per student relative to GDP per capita is far wider than at the secondary level.[17] Nonetheless, there is a

somewhat tighter fit to what proves a strongly downward-sloping relationship. Clearly, tertiary education is extremely expensive for many developing countries. One reason is that labor costs for the very highly educated personnel needed to staff universities and other tertiary institutions are exceptional in extremely poor countries. Those countries also are climbing new learning curves, building new models, and not yet reaping the economies of scale found in richer countries.

Given an absence of studies of good-practice spending at the tertiary level, it seems reasonable to carry forward the experience of more extensive analysis at the primary and secondary levels—namely, that the average-practice pattern, related to GDP per capita, is a reasonable target level.[18] Clearly, however, the right-hand tail of the curve must be kept positive (that is, countries must spend more than 0 percent of GDP on each student); Table 6.2 showed that 29 percent of GDP per capita is the average for high-income countries and thus approximates a realistic lower bound for the curve in Figure 6.7. Further, the high left-hand tail of the curve for the poorest countries, with expenditures per student at several hundred percent of GDP per capita, clearly identifies unreasonable levels for "best practice."

Although it cannot be seen in the cross-sectional analysis of Figure 6.7, tertiary spending per student has declined around the world since 1970, in high-income countries as well as in low- and middle-income countries (as the steeply downward-sloping curve would suggest for a world of rising income). In North America and Western Europe, it has dropped from more than 50 percent of GDP per capita to just below 30 percent on average.[19] In Latin America and the Caribbean, tertiary per-student spending has fallen from about 77 percent of GDP per capita to just over 30 percent, but it remains very high in most developing regions. South and West Asian countries still have costs above 65 percent of GDP per capita, and costs in sub-Saharan Africa average over 350 percent of GDP per capita (see Table 6.3 for regional per-student spending patterns). In these regions, both our base case and our normative scenario significantly reduce costs per student with continued income growth.

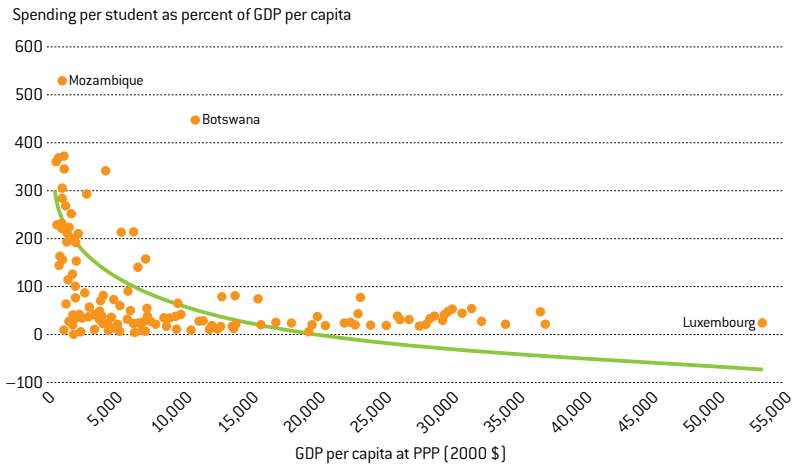
Figure 6.6 Upper secondary spending per student as a percentage of GDP per capita at PPP



Note: Vanuatu was excluded as an extreme outlier. Equation: y = 105.7639 – 8.4365 log (x); R-squared = 0.10

Source: IFs Version 6.12 using UIS and WDI data (most recent by country).

Figure 6.7 Tertiary spending per student as a percentage of GDP per capita at PPP



Note: Equation: y = 821.1709 – 82.1476 log (x); R-squared = 0.22

Source: IFs Version 6.12 using UIS and WDI data (most recent by country).

Geographic variations in spending per student

To what degree are there consistent regional variations from the global patterns of change in per-student spending as incomes rise? Table 6.3 shows spending across the UNESCO regions. Combined with the earlier enrollment analysis, the patterns in Table 6.3 suggest several geographically specific insights that are relevant to our normative scenario.

We expect that countries will tend to move toward typical levels and patterns of per-student spending over time.

First, per-student spending in sub-Saharan Africa is relatively high across all levels of education, including primary. Sub-Saharan African countries need to focus on cost structures as well as on increasing enrollment. As we have discussed before, low enrollment rates are often accompanied by higher than average per-student spending. This is noticeable at all levels above the primary level in Africa and to an extreme at the tertiary level, where it may result from the building of new and/or expanding tertiary education systems in countries with limited human and physical resources for that development.

Second, at the primary and lower secondary levels, it is low-income East Asia and the Pacific (demographically dominated by China) and South and West Asia (predominantly India) that exhibit especially low levels of per-student spending. China almost certainly will need higher public primary and lower secondary per-student spending in coming years.[20] In a society where wages and other costs are more and more market based, China is too far below average levels, even taking into account high efficiency and high private spending.

Third, even though costs per student are low at primary and lower secondary levels in South and West Asia (and we have seen that secondary enrollment itself is too low in the region), costs are too high at the tertiary level. Regional inequalities in access to education across India, combined with the colonial-like pattern of access by a few to education at all levels, have resulted in patterns quite different from broader global ones.

Table 6.3 Public spending per student as percent of GDP per capita at PPP by region

	Primary	Lower secondary	Upper secondary	Tertiary
Arab States	13.9	16.8	20.5	60.1
Central and Eastern Europe	17.6	18.6	21.9	24.0
Central Asia	8.7	14.1	10.5	13.8
East Asia and the Pacific (Poorer)	6.9	8.3	20.2	72.0
Latin America and the Caribbean	13.8	14.0	14.0	33.0
South and West Asia	9.2	9.9	26.3	65.9
Sub-Saharan Africa	14.4	23.5	60.3	356.6
East Asia and the Pacific (Richer)	20.6	23.9	20.2	17.7
North America and Western Europe	19.8	23.5	27.7	29.6

Source: IFs Version 6.12 using UIS and WDI data (most recent by country).

Conclusions for the normative scenario: Financial targets

The analysis in this section has identified per-student spending levels that represent typical practice across countries, variable by level of income. We have found some evidence, notably in bottom-up analysis, that those same values, captured in cross-sectional relationships, also represent something close to "best" practice. However, one might draw that conclusion about central tendencies in any case, especially when the patterns in relationship to GDP per capita and to each other across levels of education appear to have an internal logic. Regardless of the per-student spending levels at which countries begin our forecasts, we expect that they will tend to move toward those typical levels over time. We represent that convergence as slow in the base case (generally fifty years or more) and more rapid in the normative scenario (twenty years to reach values on the target functions). The financial targets are described as follows:

- Primary level: The analytic, cross-sectionally estimated function of Figure 6.5 provides a generally reasonable pattern of change over time as income levels change. A number of studies suggest that low-income countries generally need to spend about 13–15 percent of GDP per capita on each student to attain good-practice levels. The regression line, with low-income levels somewhat above the low-income category average of Table 6.2, provides such a target.
- Lower secondary level: An analytic function with quite flat expenditures as a portion of GDP per capita across different income levels is a reasonable representation of practice today. Low- and middle-income countries need to spend about 20 percent of GDP per capita to be near central tendency spending levels and presumptive good practice.
- Upper secondary level: The analytic function in Figure 6.6 is a reasonable pattern for change with income and target for presumptive best practice. We bound the lower level of the target range in the normative scenario at 28 percent, slightly below the average spending level across the entire range of income.

- Tertiary level: The analytic function in Figure 6.7 falls too steeply (in fact, it falls below 0 percent) to represent change over time or best practice. Instead, attention to the income-category average values of Table 6.2 can serve as such a guideline. We bound decline in the function with income increases at 30 percent, keeping target levels for spending in the normative scenario at or above that level.

Conclusion

Values and goals always shape public policy. Thus, normative scenarios in comparison with base cases—considerations of the future with and without new interventions—are part of the public policy process. With respect to the global education transition, global goals have historically had the character of relatively simple absolute targets, stated independently of the starting points of different regions and countries. Such goals serve a critical motivating function, mobilizing action and resources on their behalf. They also are seldom met.

For the actual shaping of public policy and the efficient allocation of resources, a normative scenario that takes into account the starting points of change and moves closer to levers of action (specifically, to intake and survival rates rather than enrollment rates) has benefits. Such a scenario ideally should also take into account the dynamics of the larger system(s) in which its immediate targets are embedded. Thus, attention to education at all levels, not just primary and possibly lower secondary, adds value, as does attention to the relationships between education and broader sociopolitical systems. This chapter has sketched targets for key determinants of enrollment across levels of education, and it has identified them for spending per student as well. It has indicated that such targets are only part of the creation of a normative scenario and that the model into which we place them for forecasting is also an essential element.

Such an approach to normative scenario development has a downside. The normative scenario must strike a complicated balance among many factors on both the demand and supply sides. We cannot explain the more complex normative scenario as easily as we can a clearly stated goal. Both approaches have strengths and weaknesses. This volume continues to argue, however, that the gradual elaboration of a more complete scenario for education's advance in a larger context has significant value. The next two chapters turn to the exploration of the scenario discussed here for advancing education and for development more broadly.

Appendix to Chapter 6: Analysis of Underlying Determinants of Quality Measures

International assessments (see Box 6.1) correlate highly with each other, which simplifies the task of considering the broader correlates of the educational quality that the exams presumably help to measure. We look first at the cross-assessment correlations and then turn to the analysis of broader correlates and therefore of possible determinants.

Relationships between quality assessment measures

Country-level results on the various international assessments show remarkable country-level consistency, regardless of the assessment instrument, subject area, and student grade or age. Table 6A.1 shows that the lowest R-squared, a very respectable 0.48, links the TIMSS math test for fourth-graders with the PISA reading test for fifteen-year-olds; most other correlations are much higher. The persistent tendency for low- and middle-income countries to report much lower scores than do high-income countries contributes to the magnitude of the R-squared coefficients and suggests a relationship between income and scores, to which we will return.

There is an extremely high covariation between male and female scores across countries—on the PISA reading test, the cross-sectional correlation is 0.96. The correlations of male and female scores across countries for science and math are equally remarkable, with R-squared values of 0.97 and 0.98, respectively. At the same time, however, there are some quite consistent gender differences on reading examinations across countries. Even though both males and females in lower-income countries report much lower scores on all tests than do males and females in higher-income

Normative scenarios—considerations of the future with and without new interventions—are part of the public policy process.

A normative scenario that considers starting points of change and levers of action has benefits in that process.

Country-level results on the various international assessments show remarkable consistency in country scores and rankings.

There are quite consistent gender differences on reading and math scores across countries—but not on science scores.

countries, females around the world tend to score 30–40 points higher than males on reading. On mathematics, males outscore females by about 20 points on average. However, gender differences on the science exams are essentially nonexistent.

The high cross-country correlations across exams, topic areas, levels of education, sex, and age suggest two more general conclusions. First, the tests probably are capturing some underlying dimensions of education quality (test-taking ability, if nothing else) quite well and consistently, suggesting significant reliability and even validity of the tests. Second, cross-country differences are substantial and require our attention. Exploring them may help us identify some of the drivers or markers of quality differences in education around the world.

Table 6A.1 R-squared of country scores across quality tests

	Test (see rows for identification)						
TIMSS	**1**	**2**	**3**	**4**	**5**	**6**	**7**
1. Math, 4th grade							
2. Science, 4th grade	0.92						
3. Math, 8th grade	0.86	0.76					
4. Science, 8th grade	0.81	0.86	0.91				
PIRLS							
5. Reading, 4th grade	0.80	0.94	0.77	0.81			
PISA							
6. Reading, 15-year-olds	0.48	0.59	0.58	0.62	0.61		
7. Science, 15-year-olds	0.62	0.59	0.68	0.67	0.67	0.94	
8. Math, 15-year-olds	0.66	0.67	0.77	0.64	0.65	0.87	0.92

Source: Compiled by the authors using the most recent test results in each case (years vary).

Table 6A.2 Adjusted R-squared of possible determinants of quality with PIRLS reading scores

	Relationship to PIRLS reading score		
	Bivariate	**Multivariate with GDP per capita**	**Multivariate with GDP per capita, Gini**
Female secondary education	0.28	0.25	0.25
Spending per student	0.15	0.16	0.16
Survival rate	0.31	0.30	0.65
Government effectiveness	0.23	0.30	0.46
Income equality (Gini)	0.29	0.47	
GDP per capita	0.19		

Note: Because of relatively small sample sizes and degrees of freedom, the addition of variables can reduce the adjusted R-squared.

Source: Various measures; compiled by the authors using the most recent assessment results (years vary).

Likely determinants of quality across countries

A great many factors almost certainly relate to the substantial and quite consistent differences in test scores across countries. Based on the literature and our own analysis, we selected six on which to focus:

1. Studies within countries often stress the importance of parental education levels, especially that of mothers, to the success of students (Birdsall, Levine, and Ibrahim 2005: 26).
2. Spending levels per student might also contribute generally, if not invariably, to quality.
3. As we saw previously, the survival rate is often used (as in the Education Development Index) as an available proxy for quality characteristics of education systems (characteristics potentially as diverse as teacher quality, class size, and transportation or other infrastructure systems).
4. Governance effectiveness and quality, including the absence of corruption, also may spill over into education quality. In Chapter 5, we looked at the relationship between education participation and corruption as measured by Transparency International. An even more powerful measure, however, proves to be the measure of government effectiveness from the World Bank's Governance Indicators project (Kaufmann, Kraay, and Mastruzzi 2007). That measure is intended to capture the "quality of public service delivery," so a correlation with quality of education should not be surprising.
5. Unequal income distribution could weaken the education performance of substantial numbers of students and lower average performance.
6. Not surprisingly, the income of countries, as either a proxy for some of these other factors or as a determinant in itself, is a strong candidate for helping to explain higher test scores.

In exploring the importance of each factor, we used the most recent PIRLS reading score (for most countries, that of 2006) as the summary measure. That test is administered at the fourth grade, a grade that large numbers of students are likely to reach even in low-income countries.

A reading test, with its obvious tie to literacy, is perhaps a more globally general measure of education than are mathematics and science examinations. And the country set participating in PIRLS is reasonably extensive and growing.

Table 6A.2 summarizes the relationships of the various factors with the level of PIRLS reading scores across countries. Interestingly, GDP per capita does not prove to have a very high bivariate relationship to PIRLS test scores. It is important to stress again, however, that such relationships can vary considerably as a result of only a few outliers or other changes to the country set. A correlation of GDP per capita to PISA test scores (not shown), for example, climbs to 0.60. Considerably more middle-income countries take the PISA examination.

Our analysis also looked at a full range of multivariate relationships with test scores. The most powerful combination of variables proved to be survival rate, GDP per capita, and an inverse relationship with the income Gini coefficient. This outcome reinforces our decision to include a focus on survival rates in the elaboration of our normative scenario.[21]

Analysis suggests some measurable comparative correlates of quality; the highest was survival rate in combination with GDP per capita and income equality.

1 Such an effort to develop a realistic normative scenario is in the tradition, for example, of the International Energy Agency's Alternative Policy Scenario for global energy futures. Each year, the IEA's World Energy Outlook (see, e.g., IEA 2007) refines that scenario, taking into account new data, new understandings of the global energy system and its demographic and economic drivers, changes in the actual policy environment, and insights concerning the types of policies that might achieve superior energy futures.

2 In some cases, of course, such as that of Chad or Uganda, political disruption is a significant factor in the failure of many students to complete their education.

3 Countries have come to take their relative positions on the PISA and other examinations seriously. For instance, Germany was very surprised that its relative position on the first PISA exam was not higher, which more detailed exploration suggested was in large part attributable to lower scores in its Turkish community than in the ethnically German population. The finding spurred a variety of initiatives to improve the education of the large minority population (*Economist*, April 5, 2008, 31).

4 Many developing countries participate in regional and country-specific assessments of learning outcomes that, although not necessarily comparable or widely disseminated, contribute to an understanding of quality outcomes. The *Education for All Global Monitoring Report 2008* notes that 50 percent of developing countries and 17 percent of transitional countries conducted at least one national learning assessment between 2000 and 2006, compared to 28 percent and 0 percent between 1995 and 1999 (UNESCO 2007b: 68–69).

5 In some sense, the EDI itself is a composite proxy measure of quality. Its components are (1) the primary net enrollment rate (a measure of the proportion of children of defined school age who are enrolled), (2) the adult literacy rate, (3) the survival rate, and (4) the gender-specific EFA index (a composite of the gender parity indices in primary and secondary education and the gender parity index for adult literacy). Analyzing progress on the EDI over recent years, the *Education for All Global Monitoring Report 2008* noted that whereas primary net enrollment was the component showing most improvement, "in most countries that saw low improvement or decline in the EDI, the weak point was the survival rate" (UNESCO 2007b: 95).

6 We recognize, of course, that a 2 percentage point rise from an intake rate of 30 to 32 percent is a greater relative increase than a 2 percentage point rise from 60 to 62 percent, requiring a greater percentage change in underlying resources and capabilities.

7 Bayesian analysis recognizes the value of having an expectation or "prior," which ongoing analysis adjusts iteratively.

8 The median was 1.96 percent per year, and the range was 1.39 to 7.63 percent.

9 Costs per student at higher levels of education have come down over time for countries at all income levels, including the high-income category. In 1970, high-income countries spent 50.4 percent of GDP per capita on each tertiary student (see also Coombs 1985: 158), but their tertiary spending per student has stabilized at around 28 percent of GDP per capita since about 1990.

10 We used UIS data for this analysis. The salary share is somewhat lower in Central and Eastern Europe and North America and Western Europe, and it is somewhat higher in most developing regions; cross-regional values range from 70–89 percent.

11 There have also been country-level studies, at all three levels of education, as part of the Fast Track Initiative. In addition, the Pôle de Dakar report for Africa (UNESCO 2005b) analyzed all three levels for each country.

12 With respect to aggregate spending associated with these specifics, the authors recommended that government revenues be 14, 16, or 18 percent of GDP, depending on the country's income; that 20 percent of government revenues be committed to education for recurrent expenditures; and that 50 percent of the recurrent spending be directed to six-year primary education programs and 42 percent to five-year programs (Bruns, Mingat, and Rakotomalala 2003: 73).

13 Their numbers are not strictly comparable to those in Table 6.2 for several reasons, among which is the inclusion in the table of capital expenditures that add about 10 percent on average to the base of recurrent expenditures.

14 The standard least-squares method of fitting a regression line to data weights variations from the line by the square of their size. Thus, the low-income countries significantly above the regression line shift it upward relative to the averages of Table 6.2.

15 Even when an R-squared value is very low, the slope and character of a relationship can help us understand and represent the general underlying pattern.

16 Cuadra and Moreno (2005: 142) show per-student spending in countries exhibiting fast enrollment growth to be 11, 18, and 55 percent of GDP per capita at the primary, secondary, and tertiary levels, respectively. But based on other evidence analyzed here, 11 percent at the primary level seems too low for best practice; overly rapid enrollment growth can squeeze spending per student.

17 In fact, we removed Malawi, with per-student expenditures of about 1,500 percent of GDP per capita, from the figure as an extreme outlier, as well as Ethiopia, Eritrea, and Lesotho, also with spending above 800 percent of GDP per capita.

18 Analysis of costs per student at the tertiary level are complicated by many factors, including the high variability across countries of public-private spending and of the types of education experiences aggregated into the tertiary category.

19 In the United States, the increasing use of part-time adjunct instructors has taken advantage of a pool of willing and qualified personnel who will work at much lower cost than full-time, tenured faculty will. In addition, the composition of tertiary education has changed; for instance, the expansion of community colleges has lowered cost structures.

20 Because spending data do not include China in recent years and China has announced plans to raise spending, this may already be well under way.

21 The apparently low level of relationship to test scores of public per student spending as a percentage of GDP per capita reinforces two conclusions that appear in much of the educational literature: first, education spending is obviously necessary, but many countries do not get a clear return from higher spending levels; second, quality is possible even at modest spending levels. These are important insights to take into account in considerations of appropriate spending levels. Still, the demonstrated instability of all of the relationships of possible drivers with test scores must make us very cautious about drawing conclusions.