Education as an Engine of Economic Development: Global Experiences and Prospects for El Salvador *

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1. Introduction

El Salvador has undergone dramatic social, economic and political transformations in the last three decades. Alter a period of social conflict that led to a severe drop of per-capita income, the Salvadoran economy recovered strongly during the 1990s. During the last seven years, however, economic growth has slowed-down sharply. In fact, El Salvador has been the slowest-growing economy in Latin America in the 2000s, with the exception of Guatemala.

What explains this stagnation? And how can economic growth take off in El Salvador? One of the forces that has been mentioned frequently by many experts and policymakers but has not received serious consideration is education.

The educational system in El Salvador has made considerable progress since 1991. The net enrollment rate in basic education (one through nine years of schooling) rose from 21 percent in 1991 to 91 percent in 2007. The net enrollment rate in *educación media* or upper secondary education (10 through 12 years of schooling) rose from 13 percent in 1991 to 30 percent in 2006. This has led to a significant increase in literacy and schooling, especially among young populations.

But despite these successes, educational attainment in El Salvador remains substantially below that of the rest of Latin America and the Caribbean. The net enrollment rate in secondary education (7 to 12 years of schooling) in El Salvador was approximately equal to 55 percent in 2007, but in the Latin America and Caribbean region it was 70 percent. The enrollment rate is especially low in upper secondary education (10 to 12 years of schooling), where it is 35.6 percent. And at the tertiary level,

enrollment rates not only are comparatively low but they have also failed to increase significantly over time. As a result, the population of El Salvador 25 years of age or older with a university degree is only 5 percent. In the whole country, less than 60,000 persons have received a higher education diploma.

It is the goal of this research monograph to study how education has been an engine of economic growth worldwide, to examine the key challenges facing the Salvadoran education system, and to make public policy recommendations that are based on the global experience but also adapted to the specific Salvadoran context. The report begins by discussing the theory and evidence on the connections between education and economic growth. The second part of the study presents the current situation of Salvadoran education, from pre-school to higher education. On the basis of this analysis, the final section provides a set of specific policy recommendations.

It is the conclusion of this monograph that investments in education can serve as the basis for the economic development of El Salvador, allowing economic growth to accelerate in the medium and long term. By boosting the cognitive and non-cognitive skills of workers, schooling raises productivity and increases income per-capita. Even more importantly, education is the basis for innovation and technical change, which are the pillars of economic growth in the highly competitive, globalized economy in which we live today. In order for educational development to stimulate growth, however, there are a number of policy reforms –both within and outside the educational system-- that are required. In addition, it is essential that Salvadoran society increase its support to education, both in terms of the priority it provides schooling in the allocation of scarce resources but also in terms of the prestige the profession is provided with.

2. Education and Economic Growth

The average Gross Domestic Product (GDP) per-capita of El Salvador in 2007 was $5,458. This places the country above the average in terms of other developing countries, which had an average income per-capita of $4,687 in 2007, adjusted for differences in cost of living. But it is also below the average for Latin America and the Caribbean, where the average GDP per capita in 2007 was $9,047. In Central America, the income per-capita of El Salvador is above that of Guatemala ($4,309), Honduras ($3,597) and Nicaragua ($2,434) but it is substantially lower than that of Costa Rica ($10,043) and Panama ($10,750).

After a decade of social conflict that led to a sustained drop in per-capita income during the 1980s, the Salvadoran economy recovered strongly in the 1990s, with the growth rate of per-capita GDP rising to 2.7 percent per year. However, as Figure 1 shows, during the last seven years, economic growth has slowed down almost to a halt.

[Figure 1 about here]

The annual average growth rate of GDP per-capita in El Salvador between 2000 and 2007 was 1.3 percent. As Figure 2 shows, this was the lowest in Latin America and the Caribbean, with the exception of Guatemala. The overall growth rate in GDP per-capita in Latin America and the Caribbean during this time period was 2.1 percent, which was itself considerably below that of the rest of the developing world, which was on average 4.9 percent.

[Figure 2 about here]

What explains the economic slowdown of El Salvador during the last decade? A number of hypotheses have been presented, including a fall in the price of agricultural products exported by El Salvador, low savings and investment rates, problems with public sector governance, and a slowdown of foreign direct investment, among others (see Hausmann and Rodrik, 2005 and Edwards, 2003). One of the factors that has been mentioned but has not received serious analysis is the role played by education. But how is education connected to economic growth?

The global experience with long-run economic growth is presented in Table 1, which displays the top ten fastest and slowest countries in growth of GDP per capita between 1960 and 2006. As can be seen, economies like Singapore, South Korea, Taiwan and Hong Kong grew at an average annual growth rate of GDP per capita of over 5 percent per year, becoming high-income economies in the process. At the same time, during the same time period, countries like Liberia, The Democratic Republic of Congo, Haiti and Nicaragua grew at an annual negative rate, meaning that they were poorer in 2006 than in 1960.

[Table 1 about here]

What explains these differences in economic growth? Over the years, a variety of factors have been examined, including investments in physical capital, social stability, demographics, natural resources, geography, etc. [see, for example, Sachs and Warner, 1995, Bloom and Williamson, 1998, Gallup and Sachs, 1999, Barro, 1997, Rivera-Batiz, 2002, Bosworth and Collins, 2003, Bloom, Canning and Sevilla, 2004, and Barro and Sala-i-Martin, 2006]. Education is one of the factors that have been considered.

The conventional wisdom is that education is a key determinant of economic growth. As the World Bank states: "Education is critical for economic growth and poverty reduction…Investment in education contributes to the accumulation of human capital, which is essential for higher incomes and sustained economic growth" (World Bank, 1995, p.1). And Economics Nobel prize winner Robert Lucas concludes in his research: "The main engine of growth is the accumulation of human capital –of knowledge—and the main source of differences in living standards among nations is differences in human capital" (Lucas, 1993, p. 270).

Nonetheless, the link between education and economic growth has been questioned recently by a number of academics. In a widely-cited paper, economist Lant Pritchett examined the statistical relationship between human capital accumulation and economic growth of GDP per capita. He found that "the estimate of the impact of growth in educational capital on growth of per-worker Gross Domestic Product is *negative*...and insignificant" (Pritchett, p. 374; the italics are the Pritchett's). And William Easterly, of New York University, concludes: ""The lack of association between growth in schooling and GDP growth has been noted in several studies…Despite all the lofty sentiments about education, the return to the educational explosion of the past four decades has been disappointing… Education is another magic formula that failed us on the quest for growth" (Easterly, 2001, pp. 73 and 84; see also Easterly and Levine, 2001, and Benhabib and Siegel, 1994).

Despite the fact that this research raises significant questions about the limitations of investments in education, questions that will be discussed later on, a number of other studies –using more recent and reliable data as well as alternative statistical methods—

have systematically found a positive association between increased educational attainment and economic growth (see Cohen and Soto, 2001, de la Fuente and Domenech, 2002, Bosworth and Collins, 2003, Bloom et. al., 2004, and Rivera-Batiz, 2002, 2007). There is also research on specific regions and countries, where the key role played by education on growth has been documented (as an example, for East Asia see Permani, 2008, for South Korea specifically see Lee, 1999, for Puerto Rico, see Ladd and Rivera-Batiz, 2006, and for the United States, see Goldin and Katz, 2008).

The simple correlation between income per-capita of a country (as measured by GDP per capita) and its schooling level is strongly positive. Figure 3, for example, shows the average educational attainment of the population 25 years of age or older of a representative sample of low-income and high-income countries and the associated GDP per capita income levels for these countries in 2007. The statistical relationship between the two variables is positive and exponential in nature, meaning that additional years of schooling have an increasingly growing impact on GDP per capita. There is no question that countries with higher educational attainment tend also to have higher income per-capita.

[Figure 3 about her]

The data also show that those countries that were able to increase their educational attainment the most during the 1960 to 2000 period were also the countries that grew the fastest. Figure 4 shows this relationship. South Korea, for example, was one of the fastest-growing countries in the world in the last 40 years. It is also the country with the greatest increase in educational attainment during this time period. The average

years of schooling of the population 25 years of age or older in South Korea rose from 4.2 years in 1960 to 11.1 years in 2000.

[Figure 4 about here]

Of course, simple correlations between variables can be accidental or spurious, unless one adjusts or holds constant other factors. This requires a statistical analysis that incorporates multiple variables into the analysis. In addition, correlation is not causality. It is essential to determine whether greater economic growth allows more resources to be used for financing education and, therefore, causes increased schooling (Bils and Klenow, 2000). It is possible that more schooling does not *cause* an acceleration of growth by itself, but that increased growth (due to other factors, such as investments in physical capital) causes an increase in educational attainment.

As part of the research activities of this report, a statistical analysis was carried out of the links between increased educational attainment of a country and its growth in income per capita (GDP per worker) between 1960 and 2000. The objective of this research was to clarify if the simple, positive relationship between increased schooling and growth is sustained in a multivariate analysis and if there is any indication of whether education actually causes economic growth instead of the other way around.

The research used data available for 62 countries, with a representative sample of developing and high-income economies. A multiple regression analysis was carried out where variables explaining growth included not only increases in educational attainment but also physical capital accumulation, openness to trade, quality of public sector governance, an index of ethnic conflict, and other variables that can influence economic growth. In addition, to help determine whether education causes growth, the level of

educational attainment of a country in 1960 (measured by the percentage of its workforce that had achieved tertiary education) was used as a variable explaining economic growth in the period of 1960 to 2000. If this variable is found to have a positive and statistically significant coefficient in the statistical analysis, it would then be consistent with a positive, causal effect of education on economic growth, holding other things constant.

The results of the statistical analysis are reported in Appendix 1 in greater detail, where the technical background of the research is also discussed. They suggest that a country that increases its average schooling by one year and the higher education attainment of its workforce by seven percentage points would have its GDP per worker growth accelerate by 0.7 percentage points a year, holding other things constant. About half of this effect is due to a direct, causal impact of increased schooling on growth. The other half is connected to a symbiotic relationship between greater schooling and growth, where increased education leads to greater growth which then allows increased investments in schooling that causes greater growth, and continuing in a spiral of benefits for the country.

There are two key reasons why increased educational attainment in a country has a positive effect on economic growth. First, the skills of the workforce increase and as these skills rise, workers become more productive and their salaries and income climb (see, for example, Psacharopoulos and Patrinos, 2004, and Patrinos et. al., 2006). The supply of engineers, teachers, doctors, and other professions comes from the educational system and with a shortage of these workers economic growth slows to a halt. In the classic analysis of this topic, Nobel Prize winner Theodore W. Schultz concluded: "Under widely different circumstances, it is true that individuals with 8 years of

elementary schooling are better prepared to move and enter upon new jobs than are those who had only 4 or less years of schooling. Likewise, those with a high school education are much better prepared to make such adjustments than those who have completed no more than the elementary grades. Economic growth, under modern conditions, brings about vast changes in job opportunities. Schooling in this connection is valuable because it is a source of flexibility in making these occupational and spatial adjustments" (Schultz, 1963, as cited by Lee, 1999, p. 11). These forces have become more significant as the technological requirements of production and the skills demanded by workers everywhere have risen sharply during the last decades (Peracchi, 2006, and Katz and Autor, 1999).

Secondly, globalization has meant that any country that wishes to increase its GDP at a high rate must offer innovative goods and services that can compete effectively in international markets. Indeed, in any dynamic economy, growth depends to a great extent on innovation and technological change (see Solow, 1957, Goldin and Katz, 2008). But technical change and the creation, design and marketing of the new goods and services associated with it requires an ample supply of individuals with the education and skills needed to carry out these activities (Romer, 2000). For research and development to take off in a country, the supply of scientific, professional and technical personnel must increase. In addition, the supply of well-prepared entrepreneurs that will take those new goods and services and offer them for sale in domestic and world markets must rise. They are all the product of the education system.

South Korea presents a clear case study of the role played by education on technological change. Korea’s human capital started to accumulate quickly in the 1950s,

even before the well-known take-off period of growth in the 1960s, through sustained investments in primary and secondary education. The country was then able to use this human capital to, first, import and adapt foreign technologies for domestic production, and then, later, as investments in higher education increased, to develop its own technological innovations. As the economist Jong-Wha Lee concludes: "human capital is considered one of the major factors in explaining Korea's remarkable economic growth. The… abundant well-educated human resources have been playing a key role in the absorption of advanced technology from developed countries and thereby bringing about Korea's high levels of technological progress" (Lee, 1999, p. 16).

On the other hand, not all countries that have invested substantially in expanding their educational systems have been able to grow at a faster rate. Egypt, for example, increased its average educational attainment between 1960 and 2000 by four years. Net enrollment rates rose to 100 percent in primary education, 78 percent in secondary schooling and over 20 percent at the tertiary level. Yet, during this same time period, the Egyptian economy grew slowly (Galal, 2002). In the case of Peru, average schooling rose by 3.4 years between 1960 and 2000, but economic growth was again disappointing; in fact, the income per-capita of Peru failed to rise at all between 1960 and 1990.

One of the main reasons why some countries that have been able to expand their educational systems rapidly have not been able to grow quickly is because of the low quality of their schooling. As a country increases the quantity of schooling, if the quality of that schooling is low –or even worse, it declines—then the result is not that positive for economic growth. Students may be enrolling in schools in great numbers, and they may even receive a primary or secondary school diploma later on, but if the quality of

that education is poor, the knowledge acquired and cognitive skills developed may be quite limited.

This is a concern that authors skeptical of the power of education to raise economic growth have noted repeatedly. It has emerged prominently in recent years, as a variety of countries, from Brazil and Mexico to Uganda and Kenya, have managed to increase sharply their primary and secondary enrollment rates since the 1990s. Serious questions have been raised as to the impact that these changes will have, due to the lack of resources faced in the classroom and the overall low quality that many of these students face when they enter school (see Reimers, 2006 and Schwartzmann, 2005). As Easterly comments on programs of rapid enrollment growth: "just herding kids into classes and calling that as education hasn't worked" (Dugger, 2004, p. 10).

On the other hand, if both quantity and quality of schooling both increase, then the impact on economic growth can be explosive. That is the case of Singapore, South Korea, Hong Kong and Taiwan, countries or regions where increased quantity of schooling has been linked to high quality as well. The research of Eric Hanushek at Stanford University has amply shown that countries whose quality of schooling is high also develop the highest cognitive skills in their workforce, which leads to greater productivity and faster growth (see Hanushek and Woessman, 2008).

In the statistical analysis carried out for this Report, the link between quality of schooling and economic growth was also investigated. Quality of education was measured using the index of quality of schooling assembled by Profs. Eric Hanushek and Dennis Kimko (Hanushek and Kimko, 2000). This index is based on the scores obtained by various countries on international assessments of student achievement, such as those

obtained from the Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Student Assessment (PISA). The statistical analysis carried out for this Report (and reported in Appendix 1) shows that an increase in the index of the quality of education of one standard deviation raises the growth of income per-capita by an average of 0.3 percentage points each year. As noted earlier, this research also shows that an increase in educational attainment –an increase in the quantity of education-- of one standard deviation raises growth of per-capita income by an average of 0.7 percentage points each year. As a result, the combination of greater quantity and quality of education (by one standard deviation) would lift economic growth by one percentage point a year. In a country like El Salvador, whose income per-capita has been growing at only 1.3 percent a year, a moderate effort to raise the quantity and quality of education would have a substantial impact on growth.

Despite these results, it is essential to note that investments in education require complementary public policies. Countries that have successfully used education as an engine of growth –such as Singapore, South Korea, Hong Kong and Taiwan—have also invested heavily in physical capital accumulation. Investment rates of over 30 percent have been sustained for long periods of time. They have also managed to adopt well-designed public policies that have supported their export-led growth strategies (Rodrik, 1995). Without these complementary policies, using education as a strategy to foster economic growth can fail miserably. An example of the latter is Cuba, where both the quantity and quality of schooling have increased sharply in the last 40 years, making the educational system of Cuba the envy of other countries in Latin America and the Caribbean (Gasperini, 1999). Nonetheless, economic growth in Cuba during this time

period has been slow. Due to well-known external and internal forces, the Cuban economy has been relatively isolated from the rest of the world economy. Open economies that have significant economic, cultural and educational links with the rest of the world can profit better from the benefits of schooling investments. Closed economies, on the other hand, face serious economic challenges, even when they accumulate human capital (Murphy, Shleifer and Vishny, 1991). It is in these countries where one observes high unemployment rates among the highly-educated. Rates of return to education remain low and those who acquire higher education tend to emigrate. From Haiti to Bhutan, the result is a lack of impact of education on growth (Rivera-Batiz, 2007, 2008).

To summarize: although the statistical evidence shows clearly that investments in the quantity and quality of schooling are associated with greater economic growth, it is also clear that complementary socioeconomic policies are required that allow increased schooling to have its full impact on the economy. Education is necessary but not sufficient for economic growth to accelerate.

3. Education Challenges in El Salvador

The last section showed the essential role that education can play as an engine of economic growth. This section proceeds to discuss El Salvador's education sector and its main challenges.

El Salvador's education system has achieved significant progress since the end of the period of armed conflict. As is shown in Table 2, the net enrollment rate in basic education (one to nine years of schooling) rose from 21 percent in 1991 to 91 percent in

2007. And the net enrollment rate in educación media or upper secondary schooling (10 through 12 years of education) increased from 13 percent in 1991 to over 30 percent in 2007.

[Table 2 about here]

As a result of these changes, the average schooling of the Salvadoran population 25 years of age or older rose from 4 years in 1991 to 6.3 years in 2006. Table 3 shows that this progress has been greater among younger generations.

[Table 3 about here]

Despite these accomplishments, El Salvador faces serious educational challenges. These can be catalogued into three main areas: access, equity and quality.

Access

The 1996 General Law of Education of El Salvador, amended in 2005, defined the different levels of the educational system of El Salvador. It established pre-schooling as well as initial education (early childhood or pre pre-schooling) as formal parts of the educational system. Nevertheless, programs that support initial education in the country are still in their infancy. This is an area where other countries have taken dramatic measures (UNESCO, 2006). In Latin America, a number of governments –including Mexico, Peru and Costa Rica—have moved quickly to support initial education, establishing frameworks and regulations for the development of that sector (Backhoff Escudero et. al., 2008).

El Salvador has been more successful in expanding pre-schooling. As Table 2 shows, the pre-school enrollment rate (among children 4 to 6 years of age) rose from 21

percent in 1991 to 51.8 percent in 2007. But this rate remains substantially below that of the rest of Latin America and the Caribbean, where the pre-school enrollment rate was 66 percent in 2007.

At the primary school level, El Salvador has achieved virtually universal coverage, with a net enrollment rate of 96.7 percent in 2007. But at the secondary school level, access remains much more limited. The net secondary school enrollment rate (7 to 12 years of schooling) was 55 percent in 2007, much lower than the 70 percent average for Latin America and the Caribbean. As Table 2 shows, the net enrollment rate in El Salvador drops sharply for children at the escuela media or upper secondary school level (10 through 12 years of schooling), where it was 35.6 percent in 2007.

Access at the tertiary level has been the slowest to rise in El Salvador. The gross enrollment rate at this level increased only from 17 percent in 1991 to 24 percent in 2007. As a result, the Ministry of Economy's Household Survey (Encuesta de Hogares de Propósitos Múltiples) found that only 11 percent of El Salvador's population 25 years of age or older had attained any tertiary education. And the percentage of the population in that age group with a higher education degree was even less, approximately equal to5 percent. In all of El Salvador, according to the 2007 household survey, only 57,919 persons had received a higher education degree (Ministerio de Economía, 2008).

Equity

Substantial differences remain in educational attainment in El Salvador by socioeconomic status and geographical location. This constitutes a major challenge for the country both in terms of basic justice and equality but also in terms of educational excellence: ample

education research suggests that those nations that have the highest quality in their educational systems, from Finland to Singapore, also have the most equitable primary and secondary school systems.

Most countries in the Latin America and Caribbean region have unequal educational systems where low-income populations have limited access (Llach, Montoya and Roldan, 1999). However, the country whose education system displays the highest quality in the region, Cuba, is also the one which offers the greatest equality of opportunity (Carnoy, 2007). In Cuba, of course, equity in education derives in large part from the income equality that the country displays. Income distribution is by far more unequal in the rest of the Latin America and Caribbean region. These income differences are then transmitted inter-generationally through gaps in enrollment rates, despite efforts to counteract them through compensatory education programs (Reimers, 2000).

In some East Asian countries, income equality and educational equality have supported each other. In these countries, the public education system at the primary and secondary levels has the mission of ensuring that all children have access to a high-quality education. Commenting on education in East Asia, the Interamerican Development Bank (IDB) researchers Claudio de Mora Castro and Aimme Verdisco observe: "If you were to randomly visit a primary or secondary school in these countries, you would have a great difficulty identifying the socioeconomic status of students in the school. The classrooms all look alike and have more or less the same resources, as compared to Latin America and the Caribbean" (de Moura Castro and Verdisco, 2002).

One of the most significant sources of inequality in El Salvador is regional. In 2007, as much as 37.3 percent of the population of the country resided in rural areas. Yet,

educational access in these regions remains substantially lower than that in urban areas. Consider, for example, the enrollment rate of youth aged 16 to 18 years old. As can be seen in Table 4, the urban enrollment rate for this age group in 2007 was 69.3 percent while it was only 43.6 percent in rural areas. And for the age group 19 to 23 years of age, the urban enrollment rate in 2007 was 31.1 percent, compared to 12.6 percent in rural areas.

[Table 4 about here]

As a result of these sustained rural-urban enrollment gaps, the educational attainment of the rural population remains substantially below that of urban populations. In 2007, the percentage of the population 25 years of age or older who had completed a basic education (9 or more years of schooling) was 36.5 percent in urban areas but only 8.2 percent in rural areas. Table 5 shows that for the 20 to 24 age group, the percentage who had completed basic education was 62.4 percent in urban areas but only 26.5 percent in rural areas.

[Table 5 about here]

One of the reasons for the comparatively low schooling in rural areas is the low income per capita prevailing in these regions of the country. Socioeconomic background is one of the strongest determinants of schooling. Even in urban areas, there is great inequality on access to education based on income. Table 6 shows that in 2004, the enrollment rate of persons between 13 and 19 years of age in urban areas was 90.2 percent for the richest quintile in the population but only 67.5 percent for the poorest quintile. The gap is even larger in higher education. The enrollment rate for persons aged

20 to 24 in urban areas was 43.6 percent for the richest income quintile while it was 14.5 percent for the poorest quintile.

[Table 6]

In recent years, conditional transfer programs have proliferated in developing countries (Patrinos, 2002). These programs offer economic payments (transfers) to poor families conditional on their satisfying certain condition, which include keeping their children in school. The most popular conditional cash transfer programs are the PROGRESA/Oportunidades program in Mexico and the Bolsa Escola/Bolsa Familia program in Brazil, but many countries in Latin America and other regions have also adopted this type of program.

El Salvador established in 2005 the Red Solidaria program, its own conditional cash transfer program. Despite the success of Red Solidaria in expanding school enrollment rates among rural, low-income families, one of the main problems that this type of program faces is the low quality of the schools that the newly-enrolled students attend (Reimers, 2006, and Schwartzman, 2005). The topic of school quality is the next issue to consider.

School Quality

As it was discussed earlier, increases in school quality are essential in allowing increased education to become an engine of economic growth. El Salvador faces serious challenges in the quality of its public educational system.

The first issue that emerges in discussions of school quality is how to measure it.

Most educators recognize the limits of student achievement tests in measuring school quality (see for example Marchesi, 2006 and Koretz, 2008). They remain, however, the simplest and most popular method of educational assessment (Clotfelter and Ladd, 1996 and Mathews, 2004). El Salvador has only a brief history in student testing. The Learning Evaluation and Progress System (Sistema de Evaluación y Logros de Aprendizaje, SINEA) was established in 2005 to develop and apply student assessments that could be used to study the quality of the school system in El Salvador. The test scores obtained by Salvadoran students in these tests show a high proportion of students who perform at or below a basic level.

The Basic Education Student Achievement Test (La Evaluación Censal de Logros de Aprendizaje en Educación Básica, PAESITA), which is administered to third, sixth and ninth grade students in language and mathematics, was first fully implemented in 2005 as part of the 2021 plan (earlier versions involved pilot populations). Table 7 shows that there is an alarmingly high proportion of public school students who perform at the lowest, most basic level of achievement, especially in mathematics. Furthermore, the proportion rises with the age of the student. Among third graders, 38.4 percent of tested students scored at the basic level, compared to 48 percent for sixth graders and 52.3 percent for ninth graders. The corresponding figures for private school students were much lower.

[Table 8 about here]

A second test, the Upper Secondary School Aptitude and Achievement Test (Prueba de Aprendizaje y Aptitudes para Egresados de Educación Media, PAES) is an exit exam, required to graduate from upper secondary education (10-12 years of schooling). The test consists of five subject areas: mathematics, science, social and civic studies, language and literature. Test scores count for 20 percent of the outcome the student needs to satisfy in the tested subjects in order to obtain his or her degree (the remainder 80 percent is accounted for by school grades).

Table 8 displays the average scores on the PAES. The overall score was 5.92 in 2007, which is relatively low on a scale that ranges from 0 to 10. The test scores have been rising, from 5.04 in 2005 to 5.92 in 2007, but given the fact that the exams were adopted so recently, it is difficult to tell if this increase is purely the outcome of greater test preparation or classroom curriculum shifts oriented to raise test scores, an issue that always emerges when tests are first implemented. Indeed, the fact that the percentage of students at the most basic level in the test declined sharply in just one academic year, between 2005 and 2006 (from 50.7% in 2005 to 9.7% in 2006), suggests this pattern (Ministerio de Educación, 2007a).

[Table 8]

Another issue that emerges in the analysis of trends in student achievement at the upper secondary level is that, at this level, there has been a massive increase in the number of students in public schools relative to private schools. Although at the basic level (first through ninth grade), the share of private school enrollment has remained around 12 percent in El Salvador, at the upper secondary school level (grades 10 through 12), the share declined from 43 percent in 1998 to 27 percent in 2007 (Cuellar-Marchelli,

2008). Since students in private schools tend to come from families with higher socioeconomic status and have significantly higher scores than those in public schools, the compositional shift between the two sectors may explain rising average scores in public schools.

A sense of the relative quality of schooling in El Salvador can be obtained from the Second Latin America and Caribbean Regional Assessment Study (Segundo Estudio Regional y Explicativo de América Latina y el Caribe, SERCE). El Salvador participated as part of SERCE, which consisted of student achievement tests administered in 2002 to a sample of third graders and sixth graders in various countries of the region. The students in El Salvador had an average score which was much lower than the average for the Latin American and Caribbean (LAC) countries in the sample. For example, the average math score for sixth graders in El Salvador was 472 (in a range of 50 to 800), substantially below the average for LAC, which was 507, and the top scorers: Cuba (637), Uruguay (578), Costa Rica (549) and Chile (517). Still, El Salvador's average score was higher than that in five countries: Paraguay, the Dominican Republic, Ecuador, Nicaragua and Guatemala (SERCE, 2008).

El Salvador also participated in the 2007 Trends in Math and Science Study (TIMSS), an international student assessment that includes a variety of countries around the world. In that assessment, El Salvador scored near the bottom of the distribution. The assessment had an average score of 500, but El Salvador's average in math for fourth-graders was 320 and for sixth graders it was 340. The range of scores in the math results for the eighth-graders in TIMSS is presented in Table 9, where the 2007 scores have been combined with some of the 2003 results, for comparison purposes. The top scores were

achieved by Taiwan (598), South Korea (597), Singapore (593), Finland (588), Hong Kong (586), Switzerland (577) and Japan (570). The bottom scorers were: Qatar (307), Ghana (309), Saudi Arabia (309) and El Salvador (340). The only other country from LAC in the TIMSS 2007 sample was Colombia, whose score was higher that that of El Salvador (380), a result shared by the SERCE, where Colombia's math test scores for sixth graders were 493, higher than El Salvador's average score of 471. In addition, Chile participated in the 2003 TIMSS, with its eighth graders receiving an average test score of 387 in mathematics, outperforming both Colombia and El Salvador.

The 2007 TIMSS assessment also tested fourth and eighth graders in science. The results are similar to those for math. The average score for the sample was 500 and the average score for El Salvador was 390 for fourth graders and 387 for eighth graders. The latter score was among the bottom four scorers in the sample, with only Ghana (303), Qatar (319) and Botswana (355) obtaining lower average scores than El Salvador.

These sobering results obtained from recent international assessments of student achievement underline the issue of quality of schooling as an essential one in the future educational reform effort of El Salvador.

[Table 9 about here]

4. Public Policy Recommendations

Based on the key challenges facing the educational system in El Salvador, as summarized earlier, this section presents a set of specific public policy recommendations. These

recommendations are based on the international experience with various programs and institutions that have functioned effectively in the world.

The first set of recommendations is related to increasing the coverage and quality of Salvadoran public schools, especially among low-income families.

1. Establish pre-school education as a national requirement for all 6 year old children in the short-run and for all 5 year old children in the medium-run, with state support for pre-school enrollment of children residing in low-income households.

Educational systems with the highest worldwide excellence, from Singapore to Finland, also tend to have high rates of pre-schooling enrollment (UNESCO, 2007, Evans, Myers and Llfeld, 2000). In Latin America, a number of countries have made great strides in raising pre-school enrollment rates. In Mexico, two years of pre-schooling is now a national requirement and early childhood programs overall are available to parents for three years. In Costa Rica, Argentina and Chile, one year of pre-schooling is required while in Cuba, pre-school enrollment rates are close to 100 percent.

The basic problem that pre-schooling targets is concisely established by psychologist Jeanne Brooks-Gunn, a professor at Teachers College, Columbia University: “children show up in school with considerable variation in cognitive skills. When we administer cognitive skills tests to students in first grade or kinder we find substantial differences” (quoted by Lee and Burkham, 2002).

These gaps are mostly due to differences in the socioeconomic background of the children's' families and the impact that home resources –books, computers, newspapers, etc.—have on cognitive skills development. As Figure 5 shows, the educational growth of a child depends on three major forces: the home environment and the family, schools and educational institutions, and the community and society where the student resides. When the child enters first grade, there is already a wide gap in cognitive skills based on differences in income and socioeconomic background (Backhoff, Bouzas, Hernández, and García, 2007).

[Figure 5 about here]

An increase of pre-school education would have a major positive impact on the school performance of children reaching first grade. This is a significant issue for El Salvador. Al least one out of every three children in the country faces serious educational challenges during the first grade, whether in the form of school dropouts, grade repetition or overage. The dropout rate in first grade in 2007 was 12.0 percent, the rate of first grade repetition was 15.2 percent and the overage rate was 11.0 percent. Pre-schooling would sharply ameliorate these problems.

But the impact of pre-schooling is even greater. Professor James Heckman, of the University of Chicago, and his colleagues, have studied the impact that pre-schooling has on subsequent student achievement and on lifetime educational and socioeconomic progress.. In a recent publication they state: "We argue that, on productivity grounds, it makes sense to invest in young children from disadvantaged environments. Substantial evidence shows that these children are more likely to commit crime, have out-of-wedlock

births and drop out of school. Early interventions that partially remediate the effects of adverse environments can reverse some of the harm of disadvantage and have a high economic return. They benefit not only the children themselves, but also their children, as well as society at large…An accumulating body of knowledge shows that early childhood interventions for disadvantaged young children are more effective than interventions that come later in life…Early disadvantage, if left untreated, leads to academic and social difficulties in later years. Advantages accumulate; so do disadvantages" (Heckman and Masterov, 2007, pp. 2-3). These results are shared by a myriad of other studies. For instance, evaluations of the well-known American pre-school program Head Start have found that the program has substantial positive impact on the labor market experiences of the students later on (Currie and Thomas, 1995).

2. Establish a Program of *Schools Always Open* at the national level that would offer compensatory programs as well as academic and cultural enrichment programs during the vacation period (November through January) for children from low-income households.

Despite early childhood interventions, one of the main results of educational research is that the gap in student achievement between children from low and high income families is maintained and may even widen through time (Ferguson, 2007, Jencks and Philips, 1998). Since low-income students constitute a large share of public schools, this problem explains to a large extent the persistent, low achievement displayed by the overall public school system. Indeed, in El Salvador, the evidence shows that a substantial percentage of

those students who achieved at the basic level in the student achievement tests discussed earlier come from low-income families.

Schools Always Open programs target children from low-income backgrounds. They have been established in a number of countries (including the United States and Mexico) and their objectives are: (1) to reduce the number of students who repeat grades by offering them compensatory education during the vacation period so that they can have a chance to pass the earlier grade; (2) avoid the depreciation in achievement that occurs during vacations and especially affects poor children.

The problem that *Schools Always Open* programs seek to resolve has been called the Harry Potter Syndrome. It refers to the research carried out by Johns Hopkins University researchers Doris Entwisle, Karl Alexander and Linda Olson, who tracked the student achievement of 800 students in 20 public schools in Baltimore, from first grade through high school. As part of this study, students were asked to take a student achievement test at the beginning and at the end of the school year. The results of these exams surprised the researchers: there was no gap in the progress of low-income and high-income students during the academic year. The gains in student achievement were approximately the same for both groups. But is this was the case, what could explain the fact that most other studies do show that low-income children fall back over time in student achievement relative to other students?

The answer to this puzzle was called the Harry Potter effect. Students coming from low income households tend to have very little academic activity during the vacation periods in-between school years. They do not read Harry Potter, as the children and youth in middle income and high-income households do. As a result, because there is

a depreciation of knowledge during the summer, low-income students tend to fall back relative to other kids. Although their achievement grows during the academic year, it does not fully compensate for the loss that occurred during the vacation. Each vacation period adds to the shortfall in the student achievement of low-income children and youth, generating an ever-growing gap over time. This achievement gap then results in greater dropout rates as well as lower progression rates into higher education for children in low-income households (Entwisle et. al., 1997, Miller, 2007).

The public policy recommendation emerging from this is to make available school-based enrichment programs during the vacation period at the end of the school year so that children from low-income households can sustain their academic proficiency during this time period. These *Schools Always Open* programs could also offer remedial courses to students who failed a grade or need to improve their academic skills. These programs could serve all students but the public sector would offer these programs free of charge to children from low-income families. It would be essential, though, that these programs be closely monitored for quality-assurance purposes. Low-quality compensatory programs have little marginal productivity.

3. Develop programs of transition from school to work at the *educación media* or upper secondary school level (10th through 12th grades)

Offered in various countries –from Germany to the United States-- school to work programs are designed to establish links between students, schools and potential employers in order to foster a smoother transition from school to work and to therefore

allow students to become more productive and employable workers. The links are established at an institutional level, through arrangements between schools or school districts and various private and public sector employers. They can involve internships, mentorships, summer employment, or even specialized career high schools. The latter offer specialized training in specific occupations geared to certain sectors of the economy, whether in finance, medicine, etc. (see Hamilton, 1990, Stern and Dayton, 1992).

The goal of school to work programs is to reduce unemployment among youth. In the case of El Salvador, the unemployment rate among persons aged 15 to 29 in 2007 was 9.6 percent, compared to 4.3 percent among persons aged 30 to 44 years of age (Ministerio de Economía, 2008). If you add the underemployment rate for the 15 to 29 age group, which hovers over 30 percent, the employment situation of young people in the transition from school to work can be seen to be quite difficult.

Evaluations of school to work programs have found them to be highly successful, not only in helping students find employment after they complete their studies but also in generating the desire among many high school students to continue their studies at the university level. Although the latter may appear paradoxical, the fact is that by exposing students to an employment sector, say a hospital, a school to work program may allow that student not just to understand the availability of certain job opportunities available to high school graduates in that sector (such as nursing) but to maybe consider as well the possibility of occupations requiring much greater education (becoming a doctor, for example). The latter may then push the student to continue their university studies (see Neumark and Rothstein, 2005, and Rivera-Batiz, 2003).

Successful school to work programs offer a curriculum that supplements academic studies with courses that relate to a profession or career, by establishing formal connections between schools and potential employers. These links can involve paid work for students, after school or during their vacation periods, but they tend to help students apply what they have learned in the classroom within a real-world context, increasing their skills while also raising their productivity (Pauly et. al., 1995).

Although school-to-work programs can be introduced in any school, the tendency in many countries has been to create specialized schools or institutes that offer courses and work linkages related to a specific career or occupation (Stern, Raby and Dayton, 1992). This Report encourages El Salvador to establish these specialized schools, which links with the next public policy recommendation.

4. Increase the diversity of the *escuela media* or upper secondary school offerings by creating specialized public schools in science, mathematics, health, fine arts, and other fields

Many countries –from Israel to the United States-- have fostered competition among public high schools by encouraging their specialization by career or by theme. Competition among public schools may be preferable to a system where public and private schools compete because of the potentially negative impact of the latter on equity grounds (see the evidence provided by Ladd and Fiske, 2000, on the case of New Zealand). But offering parents and students a greater diversity of high schools within the

public sector can promote healthy competition among them and also provide a boost to student interest and achievement.

Systems that have encouraged competition among public schools have also established mechanisms to maintain access and equity in the process of allocation of students. In countries where students can register in various public schools, there is always a commitment to offer all local students choices close to the neighborhood where they reside. But at the same time, these systems also allow schools to recruit students from other neighborhoods. The school systems establish the rules and guidelines governing such admissions. In New York City, for example, there is substantial competition among high schools, which are allowed to admit students from any place within the five boroughs of the city. The admissions processes vary from school to school but there is a high school admissions test that is part of the evaluation process. Each student has the right to apply to 12 schools among the about 600 high schools in the city. At the same time, if some students or parents do not wish to participate in the school choice process, they also have the right to attend a school close to where they live. The Department of Education of the city of New York coordinates the admissions process and offers parents informational seminars about the selection process.

Greater competition offers incentives for schools to innovate and provide a more effective curriculum and instruction. Generally, many schools decide to specialize and offer a curriculum that is different from that of other schools. The result is that students interested in different subjects can then find schools that have excellent offerings in those fields or subjects. Recently, the economist Victor Lavy found that this system of public school competition has been highly effective in improving a variety of school indicators

in Israel (Lavy, 2008). In New York city, specialized high schools in science and mathematics, fine arts, finance, etc. have proliferated. Public school choice has thus been able to improve the effectiveness of the system (Fliegel y MacGuire. 1993).

The supply and diversity of schools and programs available in a school system – from preschool to secondary schools—is essential to offering a high-quality education. However, the key resource in the educational process is the teacher. After all, it is in the classroom where the task of learning is accomplished. The following recommendations deal with the quality of teachers.

5. Create a *National Teacher Education Center,* a public institution in charge of teacher preparation and in-service professional development

The evidence available from educational research worldwide is that a high quality education cannot be achieved unless teachers are of the highest quality, offering students a challenging and innovative curriculum and instruction (Lavy, 2002, McKenzie y Santiago, 2005, and Hanushek et. al., 2005). But excellence in teaching derives from (1) a high-quality preparation through teacher education programs, (2) a comprehensive teacher induction process at the beginning of the teacher's career, and (3) the recruitment and retention in the profession of persons with the highest ability and desire to teach, with a supportive school environment that includes adequate economic and non-economic rewards and in-service professional development opportunities (Darling-Hammond et.al., 1995, Darling-Hammond et. al., 2005).

The preparation and employment of teachers involves all sectors of the educational system, including universities or normal schools, the Ministry or Department of Education, teacher unions, schools, and the teachers themselves. Because of this complexity, this process can become a fragmented and disorganized one. It is because of this reason that many countries have found it useful to coordinate or monitor teacher education by creating a separate, public entity dedicated to this task. This Report recommends that El Salvador create such an institution.

The creation of a separate, public institution dedicated to support teacher education has numerous advantages over systems where the government has no or little direct role. In many countries, including the United States as well as El Salvador, teacher education is in the hands of higher education institutions. Unfortunately, these institutions often see education as a low-priority field, as compared to business administration, engineering, or other fields—and they do not offer the teaching profession the prestige or the adequate resources that the profession needs (Rivera-Batiz, 1995). For this reason, some public sector participation in the process is required.

The teacher education framework used in Singapore, Finland and other countries with high quality school systems is one where the public sector is directly involved in the process of educating teachers, proving ample financing for this activity. The idea is to encourage the best persons to enter the profession by assisting them in the financing of their education. In addition, adequately funded national teacher education institutions seek to ensure the prestige of the teaching profession, so as to attract the best minds. In Singapore, the National Institute of Education, which is a public institution, is in charge of teacher education. The Institute is located at the Technological University of Nanyang,

although it is an autonomous part of the university. The Institute offers degrees in all fields of education, including master's and doctoral degrees. The Institute is also in charge of the professional development of teachers and other aspects of teacher training.

El Salvador currently does not have any significant public sector involvement in the training of teachers. This Report recommends that the government create a teacher training institution that would be autonomous of the Ministry of Education but would be financed by --and would work closely with-- the Ministry. This institution, the National Teacher Education Center, could be located at a university (or universities) and offer university degrees in the field of education, including master's and doctorates. Alternatively, the institution could support the financing of teacher education in the country indirectly, providing funds to –and closely collaborating with-- teacher education programs in the creation of a high-quality teaching labor force.

6. Establish a *Teacher Induction Program* for the recruitment and promotion of teachers.

Currently, El Salvador does not have any formal program or system that systematically evaluates and promotes teachers on the basis of their performance or quality. This Report recommends that such a program be created by the Ministry of Education.

One of the main tasks of a Teacher Induction Program would be to create a period of apprenticeship for teachers, such as a three-year period. During this time period, the new teacher would enter the school system with the assurance that the system would fully support his or her instructional activities by means of mentorship relationships with

senior teachers, the availability of classroom assistants, and professional development links with teacher education programs. The teacher, on the other hand, would be evaluated and would need to show his or her pedagogical abilities and skills, demonstrate a satisfactory knowledge of his or her subject area, and the appropriate personality traits to become an effective teacher.

One of the key failures of many educational systems is the lack of attention paid to the period of entry of teachers into the profession. The evidence shows, however, that it is very difficult to accurately predict the quality of a teacher except when the teacher is in the classroom (Murnane, 1991, and Murnane and Steele, 2007). Some experts believe that establishing more strict standards in teacher education, such as higher scores in teacher certification exams, would help in increasing the quality of teaching. But these requirements often reduce the supply of teachers and the evidence available is that they do not necessarily increase teacher quality (Murnane y Steele, 2007).

What we do know is that classroom experience --both pre-service and in-service-- is the only true test of a teacher's ability to teach and that school systems that offer support to the new teacher during the first years of teaching tend to be the most successful. (Murnane, 1991). In fact, because of the absence of these support systems, the great majority of teachers –in El Salvador and elsewhere-- drop out of the profession during the first three years after they begin their jobs (Moore et. al., 2005, Hanushek et. al., 2004). A formal program through which teachers are inducted into the teaching profession will raise teacher quality by allowing the best teachers to remain in the school system.

7. Create a *Salary Incentive System* for science, mathematics and English teachers.

In order to attract the best teachers, there is a need to offer them adequate compensation. Ample evidence suggests that university students that are considering teaching as a profession do seriously look at the working conditions that they will face as teachers. Although the school working environment (facilities, collegiality, etc.) is perhaps the most important characteristic that potential teachers look at, salaries are also important. Studies in the U.K., Australia, the U.S. and some developing countries all tend to show that increased teacher salaries helps in attracting and retaining teachers (Murnane, 1991, Chevalier et. Al, 2002, Leigh, 2005 and Vega, 2007).

The shortfall in the average salary of teachers relative to other occupations is the greatest for teachers in mathematics, science and English. Teachers specialized in these areas in El Salvador have more attractive job alternatives and it is therefore more difficult for the educational system to attract and retain them. These are precisely the fields, however, where teacher shortages are of the greatest cost to the country. In a globalized economy, where innovation and new technologies are at the crux of productivity and growth, and where international trade often requires the knowledge of English, excellence in the teaching of science, mathematics and English is essential.

Students interested in education as a field often have a strong desire to teach and can be convinced to remain in the profession if they are offered additional compensation. Furthermore, there is an ample supply of teachers in other fields who may be induced to study and specialize in science, math and English with adequate economic incentives. (Glewwe, Holla and Kremer, 2007). This is especially the case if the school environment

that the teacher enters into is warm and supportive, with adequate facilities, small or moderate class sizes parental support, curriculum autonomy, and a helpful school administrative team, an issue that was discussed earlier and for which policy recommendations were already suggested. Favorable school working conditions can compensate for shortfalls in wages relative to other professions (Buckley et. al., 2005).

In many developing countries, poor working conditions lead to high absenteeism rates among teachers. It is a problem that many governments are trying to deal with through a variety of innovative policies (Duflo et. al. 2007). It is not a topic that has been discussed or even studied in detail in El Salvador. This report recommends that the issue of teacher and student absenteeism be investigated, especially in rural areas. A survey on this topic may be important to carry out and may be combined with a more general survey of the working conditions facing teachers in the country.

8. Establish an *Educational Administration and School Management Professional Career* in El Salvador

School governance and accountability systems are two of the most active areas of school reform all over the world. In the United States, the No Child Left behind initiative had as one objective making accountability an integral part of school activities. But in many other countries, from Chile to China, educational administration and accountability systems have been the target of reform in the last two decades.

Most school systems have become increasingly decentralized, in some way or another. El Salvador is well-known for the decentralization reforms brought about by the

EDUCO program, which allow communities to control school decision-making. But this is a worldwide phenomenon. Under the name of school-based management, community schools, site-based management, school choice, etc., these reforms have been implemented in a variety of countries, including: Australia, New Zealand, Zimbabwe, Spain, Chile , Colombia, Argentina, and Puerto Rico, among many others. The approaches to decentralization are as varied as the number of countries which are implementing these reform measures. There are, for example, variations in the powers that are transferred to the schools to promote administrative autonomy and local decision-making. In Argentina the National Ministry of Education transferred powers from the federal to the provincial level. In Nicaragua, this transfer was made to municipalities. In New Zealand, administrative powers were transferred directly to the schools.

Both increased accountability and decentralization place increased burdens on school administrators. School administration now requires a detailed knowledge of management techniques, human resources, finance, and a variety of specific education-related governance aspects, such as the evaluation and assessment of students and teachers. Because of the significance of the tasks accomplished by school administrators for student learning and achievement, educational research shows that school governance is a major factor affecting school quality (Sergiovanni, 2005).

Yet, in El Salvador, the process of selecting school administrators has remained informal and does not involve any formal training requirements. Establishing an educational administration and school management professional career in El Salvador means that minimum educational requirements will be applied to anyone applying to become a school director. Since some universities already offer courses and programs in

educational administration and leadership, the infrastructure already exists for school teachers to acquire the adequate preparation to become school administrators. In exchange for the acquisition of these skills, the school system should also consider establishing a salary structure that rewards this training. Furthermore, the government should be willing to support the skills upgrading of existing school administrators as well as that of teachers that are potentially considering administration as a career. Given clear synergies, the greater involvement of the public sector in teacher education proposed earlier should be accompanied by an increased role in the training of school administrators.

9. Create an independent *National Center of Educational Assessment*

This Center would be an autonomous or semi-independent agency in charge of monitoring the educational reform activities undertaken by the Ministry of Education, to ensure the goals of the Plan 2021 are satisfied. The Ministry of Education would submit annual reports to this institution regarding its accomplishments in fulfillment of educational reform efforts. The Center, governed by a board of independent, national experts in the field of education, would also be involved in the systematic and independent assessment of student achievement, with the goal of seeking greater accountability.

Many countries have created institutions that are semi-autonomous from the Department or Ministry of Education in order to ensure that educational progress is measured independently of political pressures. In the United States, the National

Assessment of Educational Progress is an autonomous institution whose role is that of testing students all over the country (in various subjects and in different grades) in order to establish tendencies in student achievement in public primary and secondary schools. In then island of Puerto Rico, educational reform efforts in the early 1990s led to the creation of the General Council of Education, an institution whose goal was that of monitoring the activities of the Department of education of the island in carrying out education reforms. The Council had public financing but it was established as an entity that was autonomous of the Department of Education of that nation (Rivera-Batiz, 1995).

The problem that these autonomous institutions seek to resolve is the incentive that school authorities have in showing that their reforms are having a positive effect. The incentives are for school participants, from students and teachers to department or ministry officials, to manipulate or adjust test results or system data so that it can be shown that more students are succeeding and reforms are being successful (Jacob and Levitt, 2003). In the United States, the results obtained by the National Assessment of Educational Progress frequently show that students have proficiencies that are well below those established by local and state authorities through their own battery of tests.

10. Development of a plan to evaluate and intervene in schools with a systematic record of low performance

In order for accountability to be effective, it is necessary that the state intervene in those institutions that are not functioning adequately and that require change. This process should involve parents and the community, school teachers and administrators as well as

students. The goal here should be to both request progress from failing schools but also to assist non-performing schools in improving their educational services.

The first step required for an agile method of intervention in low-performing schools is a system of information that provides detailed data on schools and students across the country. A history of school and student indicators should be available electronically and at the disposal of school authorities.

. On the basis of the information available from this type of system, one can then identify those schools that have the poorest performance. This should include the use of trends in test scores (test scores tend to have great yearly variability and should be used for accountability purposes only after several years of data are available). But it should also involve other measures of student achievement and progress, such as value added, which measures changes, not levels, in student achievement. On the basis of such a careful monitoring of school performance, a decision can be made on which schools the state should intervene in.

One model that El Salvador and other countries can use is that of Chile. This country first developed a comprehensive system of assessment in the 1980s, called the Sistema de Medición de la Calidad de la Educación (SIMCE). The student achievement tests carried out by this assessment system are now carried out every year and are closely monitored not only by school authorities but also by the public in general.

In the 1990s, the Chilean government implemented their P-900 program. This program identified the 900 public schools with the lowest test scores in the SIMCE. On this basis, the government allocated greater resources to these schools, most of which were located in poor neighborhoods. A variety of programs were designed to assist the

schools, including infrastructure investments (computers, libraries), funds for the design of innovative curricula proposed by teachers, professional development for teachers, introduction of classroom assistants, etc. (DiGropello, 2002).

Such a program of intervention will assign resources where they are needed the most and provide greater cost-effectiveness in the allocation of resources. The reality is that despite the progress achieved by El Salvador in the last decade, there are very basic school inputs that do not exist in many schools, especially those in rural areas and in poor, urban neighborhoods. For instance, in 2006, the percentage of all students at the basic school level (first through ninth grade) with access to the internet was only 17.3 percent and for upper secondary school students it was 46.1 percent.

11. Require the accreditation of all higher education institutions in the medium-term. Provide incentives for accreditation in the short-run through funds for research and scholarships to institutions that are accredited.

El Salvador has increased substantially its primary and secondary education enrollment rates in the last 15 years. This suggests that the next step in the educational progress of the country will be for higher education enrollments to boom over the next decade. It is essential, therefore, that the government undertake a careful study and reform of its higher education system at this time. The following recommendations concern tertiary education institutions.

One of the key challenges facing higher education in El Salvador is quality. At the present time, universities have the choice of submitting or not to the process of

accreditation. This option should be eliminated in the medium-run. The threat of a growing number of low-quality institutions granting degrees in a variety of fields creates confusion in the labor market and reduces the value of a university diploma.

The issue of how to organize public and/or non-governmental institutions to ensure the quality of higher education offerings has been a topic of great discussion in the last decade, especially in Latin America (Holm-Nielsen and Thorn, 2005). International organizations, from the World Bank to the United Nations, have had active initiatives to promote and build capacity in developing countries for quality assurance in the tertiary sector. Many countries have also moved on their own to strengthen regulatory structures.

In the United status, the power of regulating higher education is decentralized and lies at the state level. Each state establishes its own rules regarding the licensing and accreditation of higher education institutions. Some states are stricter than others. In some states, a university can obtain a license to operate, but this ensures only a minimum quality and does not ensure an adequate quality of instruction. Non-governmental organizations have emerged to offer institutional accreditation, but these function on a voluntary basis. Furthermore, the university accrediting organizations evaluate only the overall functioning of the university, including its governance, admissions processes, resources, and overall institutional effectiveness. This does not ensure the quality of specific programs within the institution. It is for this reason that there are other, additional organizations that provide accreditation or certification in specific fields, such as engineering, medicine and teacher training. The states also establish their own requirements for anyone to enter a profession, and this may require that a university be accredited.

It can be concluded that, although the United States has a voluntary accreditation system, the various layers establishing requirements at the institutional or programmatic level have created a system that provides significant overall quality assurance as well as transparency to the student considering various options. By contrast, the rapid, uncontrolled growth of the higher education sector in Latin America during the last decades has left a vacuum in terms of regulation and accreditation of these institutions in the region (Levy, 1997, Balan, 1996, Holm-Nielsen y Thorn, 2005, Brunner et. al., 2006).

This report recommends that accreditation of all higher education institutions should be sought in the medium-run. In the short-run, incentives should be provided for institutions to seek accreditation though various programs of public funding –for research and/or financial aid-- offered only to accredited institutions.

12. Establish policies that promote the differentiation of tertiary education institutions in El Salvador and linkages with secondary education institutions.

Most effective higher education systems display great diversity of institutions. In the United States, one of the most successful higher education systems in the world, institutions are differentiated into:

- Institutions that offer two and three-year programs leading to diplomas and associate degrees in a variety of technical and professional fields (*community colleges*)

- Liberal education institutions that offer 4-year or 5-yearr programs leading to the bachelor's degree.
- Research-oriented institutions that offer programs leading to bachelors, masters and doctoral degrees, with research-oriented faculty.

The United Status is not the only country with this type of highly differentiated higher education system. Singapore, another country with excellent university education, has a system with three floors as well. The first floor is geared to providing a general education, with a wide array of degrees offered. The second floor is oriented to very specific technical and professional careers, some of them in high demand in the private sector. The third floor consists of two prestigious universities, the National University of Singapore and the Nanyang Technological University, both of which are research-oriented institutions involved in innovation and research and development (Selvaratnam, 1994).

This report recommends the implementation of government policies to promote the differentiation of institutions within the tertiary education sector of El Salvador. For example, one of the challenges facing higher education in El Salvador is the low enrollment rates at the tertiary level. A community college system might increase student enrollment in higher education by broadening the access to low-income students, many of whom could later advance to 4-year or 5-year institutions (see Rouse, 1994, Bailey, 2007). Community colleges could also be linked more closely to secondary education institutions, facilitating the enrollment of students in higher education (De Castro Moura, 2003).

In terms of fostering the development of research-oriented universities, the Salvadoran government could use the existing network of technological higher education institutions under the program MEGATEC to develop a layer of publically-supported, research-oriented institutions in the areas of science and technology. These could become national centers of excellence, emerging as vehicles for potential regional and international research and development collaborations (for a discussion of policies oriented to developing research-oriented, world-class higher education institutions in developing countries, including case studies from China and India, see Altbach and Balan, 2007).

The development of these institutions should be a high-priority for El Salvador. Academic and scientific research is linked to innovation and technological change, but El Salvador ranks low worldwide on this, as Figure 6 shows.

[Figure 6 about here]

The case of China provides an instructive example of the role played by investments in higher education on the development of the high-tech skills needed for rapid economic growth within the context of a developing economy. Even though still a low-income country by international standards, the government of China has developed a plan to invest on a massive scale in selective institutions of higher education with the objective of achieving world-class excellence (Altbach and Balan, 2007). It is part of a strategy to develop export sectors that compete with those of high-income countries. It is a strategy that India has followed recently as well and that countries in East Asia, from Japan to South Korea, adopted in the past with great success.

Economists Ricardo Hausmann and Dani Rodrik have argued recently that economic growth in developing countries depends to a great extent on what type of product the country exports (Rodrik and Hausmann, 2006). Countries that decide to invest in the export of products that high-income countries produce, such as electronics, pharmaceutical products, aircraft, etc., tend to have a stronger record of economic growth than countries that specialize in producing traditional developing country exports, such as low-tech manufactures (textiles), agricultural products, etc. On this basis, they calculate an index of the income content of exports. This index considers the main export sectors of a country and calculates the average income of the countries that are the main exporters of these products worldwide. They find that developing countries that have a high value of this index also have greater economic growth. The index is high for China and India, relative to the income per capita of these countries, and even higher for South Korea and Japan. In El Salvador the index is comparatively low given that the main exports of the country are concentrated in traditional export sectors, such as agricultural products (coffee, sugar and ethanol, products exported by other developing countries such as Brazil, Colombia, Costa Rica and South Africa). In addition, manufacturing exports in El Salvador are based on low-tech, maquila-type products that other developing countries also export. By contrast, India and China have focused on increasing exports of high-tech products, such as electronics and pharmaceuticals, sectors which have a greater potential for innovation and technological change in the future.

The recommendation here is the increased use of public sector investments to develop a segment of the current higher education system in El Salvador into world-class institutions in the areas of science and technology. The growth of such institutions may

spur growth on its own but may also spark greater collaboration with the private sector in the development of new, more dynamic export sectors in El Salvador. At the present time, government investments in education are concentrated on one national university, whose resources are comparatively low when compared to other universities in the region. This brings us to the last set of recommendations.

13. Greater Public Financing of Education

Some of the reforms and programs recommended by this Report require substantial additional resources. Of course, it should be emphasized that these resources constitute an investment, with substantial future payoffs in the form of greater economic growth. But one can ask where the short-term financing for these reforms will come from.

Public investment on education in El Salvador has grown since 1992. Public spending on education as a percentage of Gross Domestic Product (GDP) rose from 1.9 percent in 1992 to 3.0 percent in 2007. But this public effort in financing education remains substantially below that of other countries, some of which are considerably poorer than El Salvador, as is shown in Table 10.

[Table 10 about here]

The Plan 2021, the latest national educational reform effort, has the objective to raise the percentage of GDP invested in education to 6.2 percentage points. If this plan were to be followed, the additional resources would provide ample funds to finance most of the programs and proposals presented in this Report (Cuellar-Marchelli, 2006). It

should be one of the highest priorities of the government to seek to achieve this goal as soon as possible.

14. Promote education as the basis for social and economic development in the country

In countries that have high-quality education systems, from Cuba to Japan, education has high societal value, with the teaching profession receiving high prestige and the classroom considered as the cradle where the future is forged (Carnoy, 2007, Duke, 1986, Rohlen, 1983). This allows a school environment that promotes social cohesion and is attractive to students, parents, teachers and other school stakeholders. It also allows special efforts on behalf of education by the overall population fo the country.

The reforms and programs recommended in this report are intended to deal with specific educational issues. But perhaps the most important policy recommendation is this last one, which seeks to raise the prestige of the education sector and the role of schooling as a source of progress for all Salvadorans.

Concluding Remarks

This study has presented evidence supporting the view that the social and economic development of a country is intimately linked to education. But for an education system to fulfill this function, it must provide adequate access, equity and quality. El Salvador has made significant progress along these lines over the last 15 years. But this has been

partly a process of catching-up and much remains to be accomplished. It is hoped that the analysis and policy recommendations presented in this Report will assist El Salvador as it seeks its own path towards educational development.

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Figure 1. Income Per-Capita in El Salvador, 1980-2007
(Gross Domestic Product per Capita in 2005, PPP-Ajusted in US$)

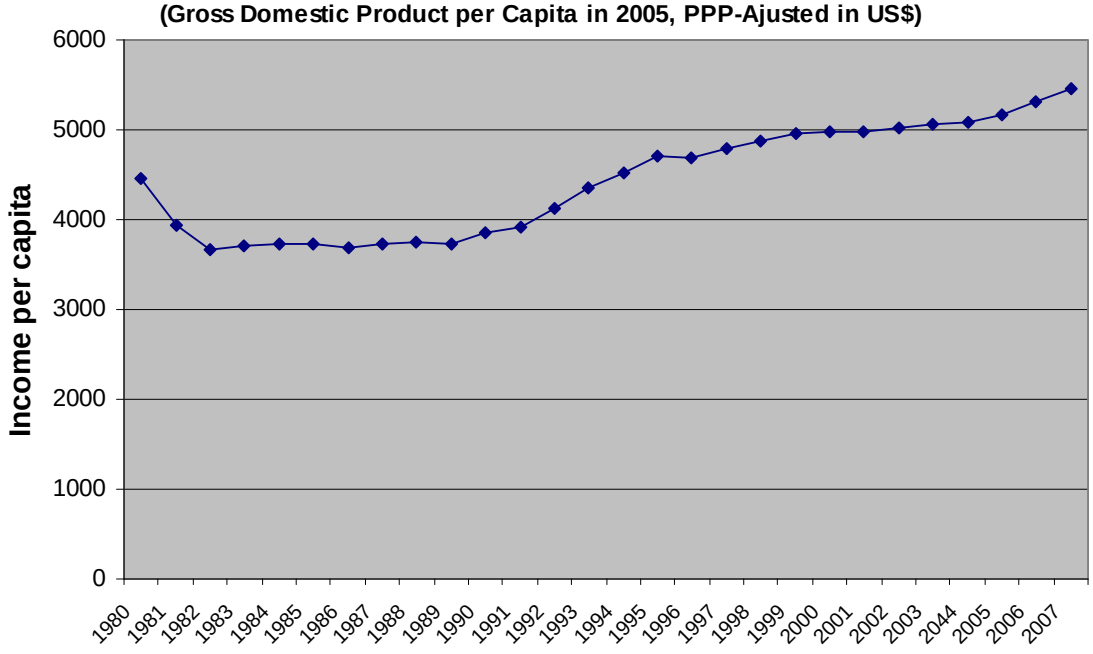
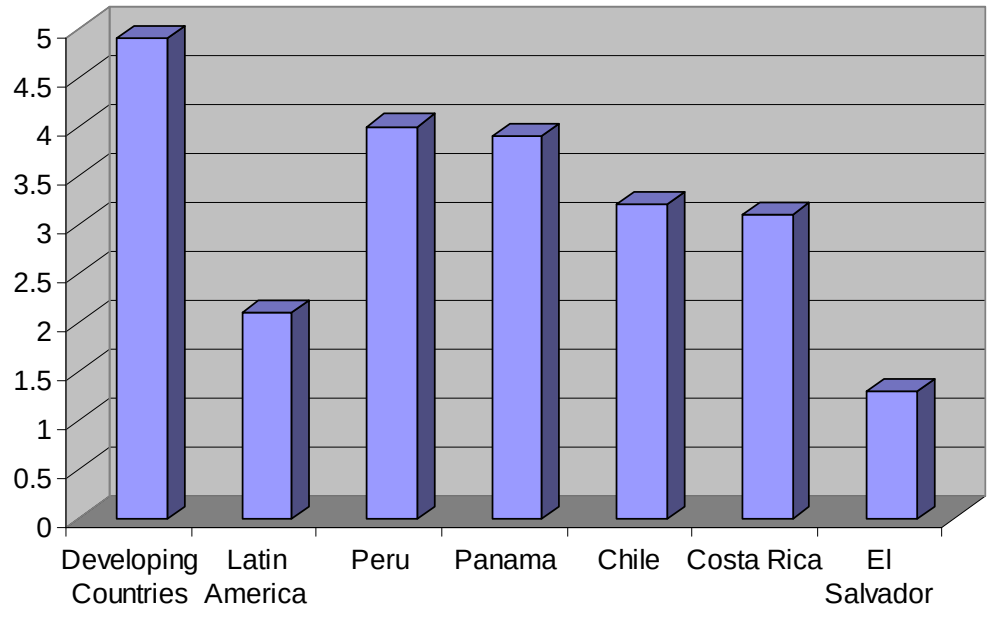


Figure 2. Growth in Income Per-Capita, 2000-2007
(%Change in GDP per-capita, PPP-Ajusted in US$)



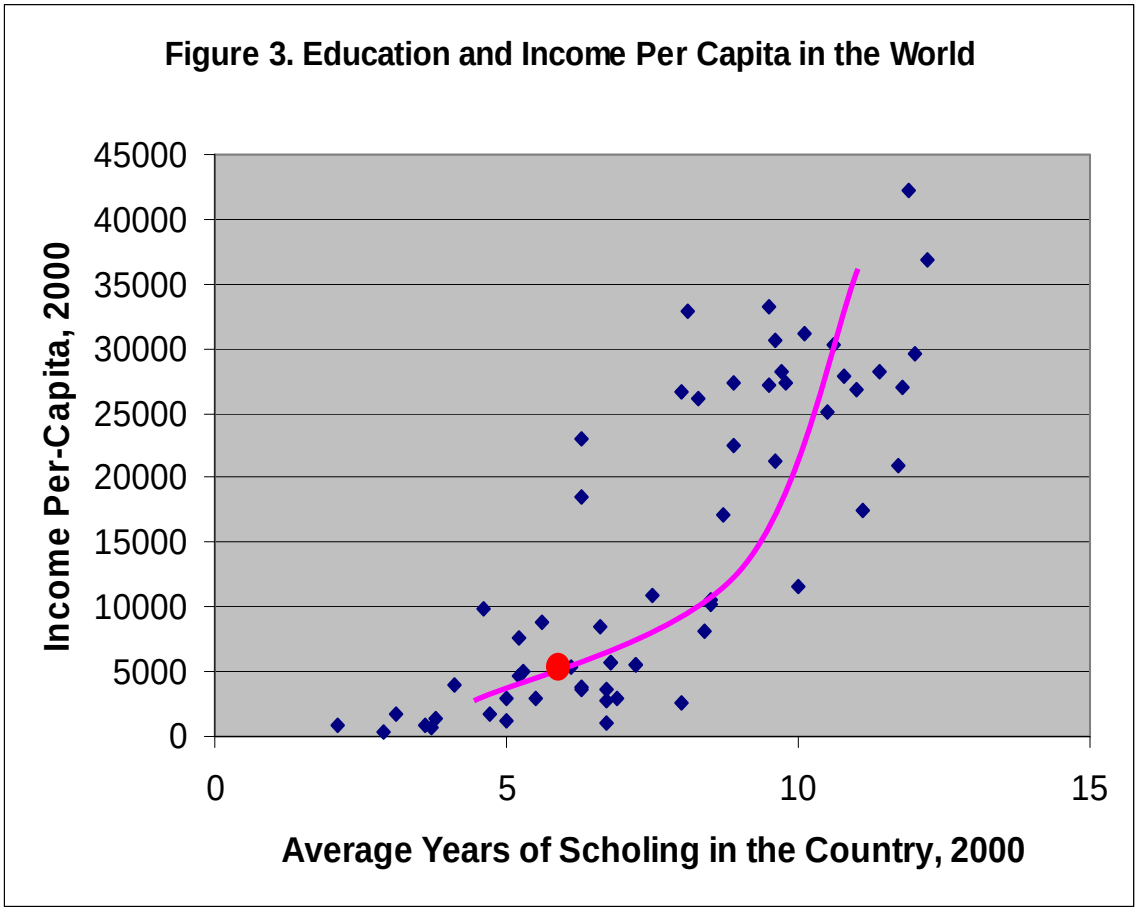
Source: World Bank, *World Development Indicators*, 2008.

Table 1. Countries with Highest and Lowest Economic Growth in Income per-capita* in the World, 1960-2006

Country	Annual growth of income per-capita 1960-2006 (Percentage per year)
Top Ten Countries in Economic growth	
Singapore	6.1%
South Korea	6.1
Taiwan	6.0
Hong Kong	5.5
China, Mainland	5.5
Thailand	4.2
Malaysia	4.1
Ireland	4.1
Botswana	4.0
Portugal	4.1
Bottom Ten Countries in Economic Growth	
Liberia	-3.7%
Congo, Democratic Republic	-2.1
Haiti	-1.5
Burundi	-1.4
Madagascar	-1.1
Central African Republic	-0.8
Nicaragua	-0.1
Guyana	-0.1
Sierra Leone	-0.1
Comoros	0.0

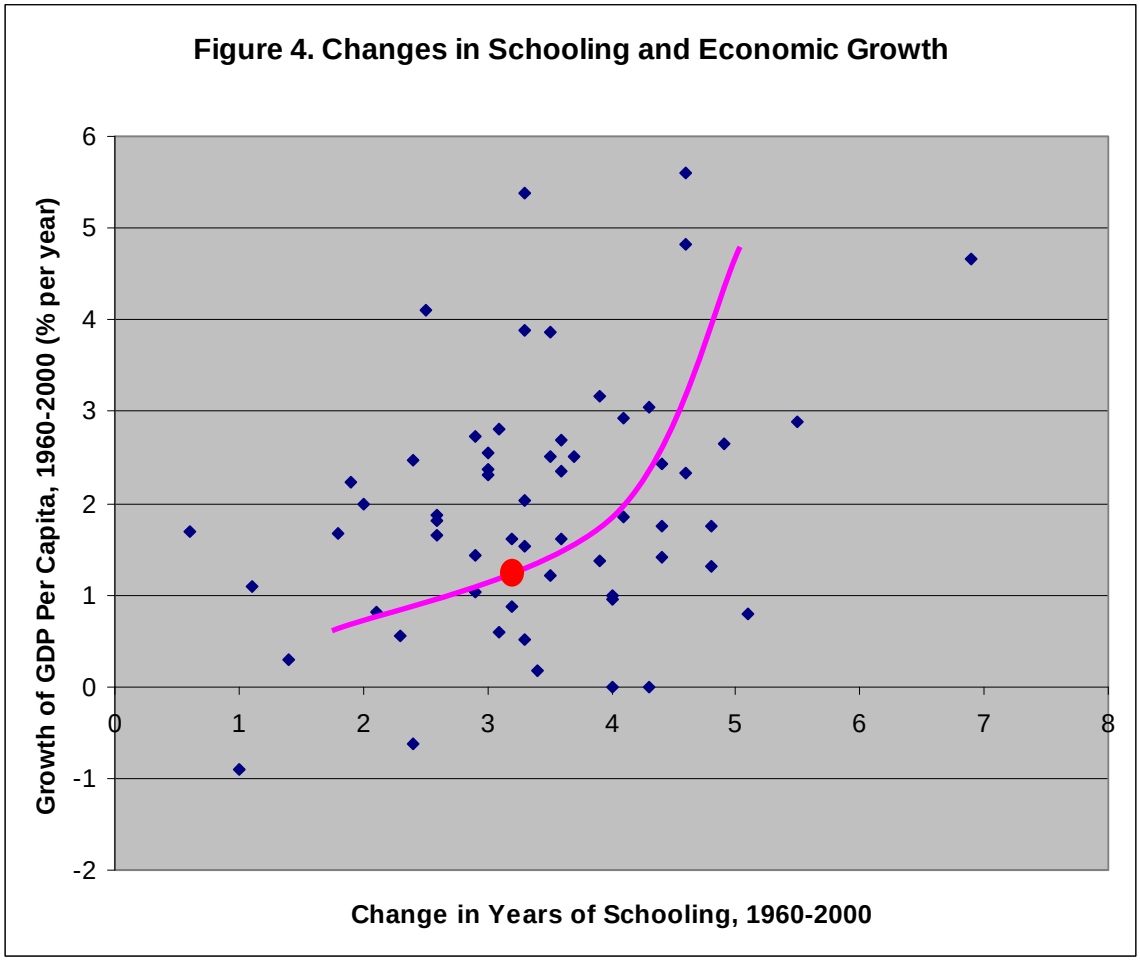
* GDP per-capita, adjusted for inflation and for differences in the cost of living.

Source: World Bank, *World Development Indicators*, 2008.



● = El Salvador

Source: Author's calculations..



● = El Salvador

Source: Author's calculations.

Table 2. Changes in Enrollment Rates, 1991-2007

Grupo	Enrollment Rate	
	1991	2007
Pre-School (gross rate)	21%	51.8%
Basic (net rate)	21	96.4
Upper Secondary (net rate)	13	35.6
Tertiary (gross rate)	17	24

Sources: Informe de la Organización de Estados Iberoamericanos y del Ministerio de Educación de El Salvador; UNESCO, *World Education Indicators* 2000, Paris, 2002. Para 2007: Memoria de Labores, Ministerio de Educación de El Salvador, 2008.

Table 3. Increased Educational Attainment in El Salvador, 1991-2006

Group	Average Years of Schooling	
	1991	2006
15 to 24 Years	6.3	8.2
25 to 59 Years	4.6	7.2
Over 60	1.7	2.1

Sources: Informe de la Organización de Estados Iberoamericanos y del Ministerio de Educación de El Salvador. San Salvador: 1996. Encuesta de Hogares de Propósitos Múltiples y Ministerio de Educación de El Salvador, 2008.

Table 4. Rural–Urban Inequality in Enrollment Rates, 2007

Group	Enrollment Rate	
	Urban	Rural
16 to 18 Years of Age	69.3%	43.6%
19 a 23 Years of Age	31.1	12.6

Source: Encuesta de Hogares de Propósitos Múltiples 2007, Ministerio de Economía de El Salvador, 2008.

Table 5. Rural-Urban Inequality in Educational Attainment, 2007

Group	Percentage of the Population that has completed 9 years of Schooling or More	
	Urban	Rural
20 to 24 Years of Age	62.4%	26.5%
25 Years of Age	36.5	8.2

Source: Encuesta de Hogares de Propósitos Múltiples 2007, Ministerio de Economía de El Salvador, 2008.

Table 6. Educational Inequality on the Basis of Income, 2004

	Income Distribution Quintile in El Salvador	
	Lowest	Highest
Enrollment Rate for Persons Aged 13 to 19 Years of Age	67.5%	90.2%
Enrollment Rate for Persons 20 to 24 Years of Age	14.5%	43.6%

Source: CEPAL, *Panorama Social de América Latina*, Santiago de Chile, 2007.

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Table 7. Results of the 2005 Assessment: Percentage at Basic Level

		Third Grade	Sixth Grade	Ninth Grade
Mathematics	National	36.5%	45.5%	48.9%
	Public	38.4	48.0	52.3
	Private	19.8	24.5	28.5
Reading	National	30.1%	26.7%	29.6%
	Public	32.2	28.7	32.4
	Private	11.7	10.2	12.6

Source: Ministerio de Educación, 2006.

Table 8. Average Test Scores on the PAES, 2005-2007

	2005	2006	2007
Overall Results	5.04	5.53	5.92
Mathematics	4.67	5.22	5.30
Natural Science	5.19	5.53	6.00
Social Science	5.07	5.87	6.40
Reading	5.00	5.87	6.00

Scale from 0 to 10.

Source: Ministerio de Educación, Informe de Logros, 2006 y 2007-2008.

Table 9. Performance of El Salvador in the Trends in International Mathematics and Science Study, 2007

Country	Average Mathematics Score, Eighth Grade (50-800 scale)		
Taiwan	598	Ukraine	462
South Korea	597	Romania	461
Singapore	593	Moldova	460
Finland	588	Bosnia and Herzegovina	456
Hong Kong	586	Lebanon	449
Switzerland	577	Macedonia	435
Japan	570	Turkey	432
New Zealand	568	Jordan	427
Canada	567	Tunisia	420
Belgium	537	Georgia	410
Holland	536	Iran	403
Ireland	533	Bahrain	398
Estonia	531	Indonesia	397
Hungary	517	Syria	395
United Kingdom	513	Egypt	391
Russian Federation	512	Chile	387
Spain	510	Algeria	387
United States	508	Colombia	380
Latvia	508	Philippines	378
Lithuania	508	Oman	372
Czech Republic	504	Palestine	367
Slovenia	501	Botswana	364
Australia	496	Kuwait	354
Sweden	491	**El Salvador**	**340**
Scotland	487	Saudi Arabia	329
Serbia	486	Ghana	309
Italy	480	Qatar	307
Malaysia	474		
Norway	469	Country Average	500
Cyprus	465		
Bulgaria	464		

Source: Trends in International Mathematics and Science Study (TIMSS) 2007, combined with some countries from the 2003 TIMMS.

Figure 5. Factors Influencing Student Achievement

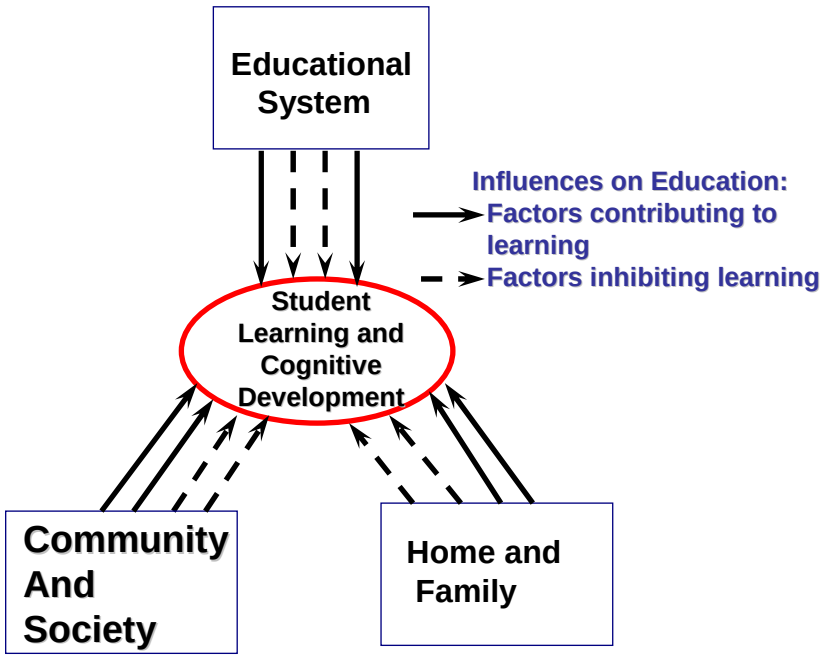
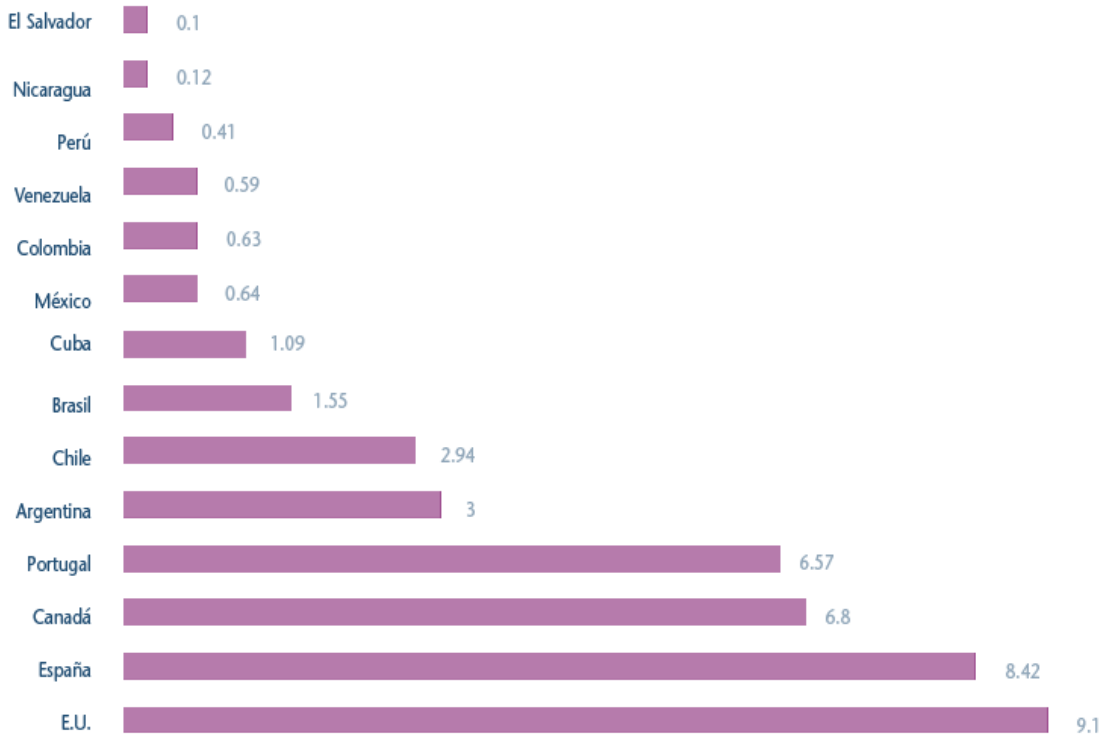


Figure 6. Number of Researchers in the Country per 1,000 Persons in the Economically Active Population



Source: CEPAL, 2007.

Table10. Public Investment in Education, 2005

Country	Public Spending as % of GDP	Public spending per student as % of GDP per capita		
		Primary	Secondary	Tertiary
El Salvador	3.0%	9.5%	10.5%	17.2%
Cuba	9.8	37.6	41.1	59.0
Mexico	5.4	14.9	15.7	41.3
Costa Rica	4.8	17.0	17.3	36.3
Brazil	4.4	14.1	12.7	35.9
Panama	3.8	9.6	12.3	26.5
Malaysia	6.2	14.6	21.1	71.1
Thailand	4.2	20.0	10.1	24.9
Kenya	6.7	23.6	23.5	262.6
Ghana	5.4	12.8	34.5	209.8
USA	5.6	22.0	25.7	27.6
Finland	6.5	18.8	32.9	36.6
South Korea	4.6	19.2	25.0	9.0

Source: UNESCO, Global Education Digest, 2007.

Appendix 1

Education and Economic Growth: A Statistical Analysis

The literature examining the long-run growth experience of countries has exploded in recent years (see Barro, 2000, Easterly and Levine, 2001, Pritchett, 2001, Rivera-Batiz, 2002, Bosworth and Collins, 2003, and Bloom, Canning y Sevilla, 2004). This appendix presents the empirical framework utilized in this Report to examine the links between education and growth and the main results obtained by the statistical analysis.

The first step in an empirical study of the connections between education and growth of Gross Domestic Product (GDP) or growth of GDP per-capita income is to specify the inputs that affect output or GDP at the aggregate level in an economy. This is what the aggregate production function shows. This Report adopts the following production function:

$$Y_i = A_i K_i^{\alpha} [L_i \exp(\phi Ed_i)]^{\gamma} \quad , \qquad (1)$$

which shows GDP in a country i, symbolized by Y_i, as dependent on the quantity of physical capital (K_i) used in production, the number of workers, L_i, the educational attainment of those workers, Ed_i, and a technology coefficient depicted by A_i. It is assumed that the production function is Cobb-Douglas, so that the $\alpha+\beta+\gamma=1$.

The specific functional form adopted in equation (1), which is exponential in the influence of education on GDP, is not accidental. Much research examining the links between education and growth has utilized the following, alternative production function:

$$Y_i = A_i K_i^{\alpha} L_i^{\beta} Ed_i^{\gamma} \quad ,$$

where all inputs –physical capital, labor and education— enter in the same way into the production function. Indeed, it was this type of production function that was used in the empirical research by Pritchett (2001) and Easterly and Levine (2001) noted earlier, and which led to their negative results on the impact of education on growth. Later studies, however, have noted that the exponential specification in equation (1) is more consistent with the extensive microeconomic evidence on the connections between education and income (which gives rise to so-called Mincerian earnings equations) and appears to be the more appropriate one to use as well in a macroeconomic context (see Bloom, Canning and Sevilla, 2004, and Rivera-Batiz, 2007).

Dividing both sides of equation (1) by the labor force, L_i , yields:

$$Y_i/L_i = A_i (K_i/L_i)^{\alpha} \exp(\phi Ed_i)^{\gamma} . \qquad (2)$$

This equation shows GDP per worker in a country as a function of technology in that country (A), capital per worker (K/L) and the average education of each worker, Ed. Taking logarithms on each side of the equation results in:

$$\log(Y_i/L_i) = \log A_i + \alpha \log(K_i/L_i) + \gamma \phi Ed_i$$

And applying this equation to two specific years, 1960 and 2000, and subtracting them from each other, yields:

$$\log[(Y_i/L_i)^{00}/[(Y_i/L_i)^{60}]= \ ]= \log[A_i^{00}/A_i^{60}] + \alpha \log[(K_i/L_i)^{00}/(K_i/L_i)^{60}]$$

$$+ \gamma \phi [(Ed_i)^{00} - (Ed_i)^{60}], \qquad (3)$$

The parameter A represents the technological level of the economy. The early work on economic growth (such as Solow, 1957) assumed that this coefficient was exogenous, determined by scientific revolutions or other factors that economists could say little about. However, in the 1990s, Paul Romer and other economists argued that technical change is endogenous and influenced by a wide array of forces. Human capital was one of those forces (Romer, 1990).

In the empirical work presented in this Report, the role of education on technological change is included by means of the following equation:

$$\log[A_i^{00}/A_i^{60}] = \rho + \theta(HC_i)^{60} + \mu QL_i \qquad (4)$$

where A_i^{00}/A_i^{60} represents technological change between 1960 and 2000 in country i, HC is an indicator of the human capital that is dedicated to research and development or other activities leading to innovation in that country, θ is a parameter reflecting the influence of human capital on technological change, QL is an index of the quality of schooling in a country, μ is a parameter showing the influence of quality of schooling on technical change, and ρ reflects the influence of other factors affecting technical change (such as public sector governance and policies towards innovation). Note that the value used for HC in equation (4) is the one for 1960, which is intended to measure the influence of human capital in 1960 on the subsequent economic growth between 1960 and 2000. If the coefficient θ turns out to be statistically significant, it would be consistent with a causal effect of education on technical change. Finally, given the key role played by higher education on innovation and technical change, this study assumes that HC, the indicator

of human capital dedicated to innovation, is equal to the proportion of the labor force which has achieved some tertiary education.

Substituting equation (4) into equation (3) yields:

$$\log[(Y_i/L_i)^{00}/[(Y_i/L_i)^{60}] = \rho + \theta HC_i^{60} + \mu QL_i + \alpha \log[(K_i/L_i)^{00}/(K_i/L_i)^{60}]$$

$$+ \gamma\phi [(Ed_i)^{00} - (Ed_i)^{60}], \quad (5)$$

This equation has been estimated econometrically using the following econometric model:

$$\log[(Y_i/L_i)^{00}/[(Y_i/L_i)^{60}] = \beta_o + \beta_1 HC_i^{60} + \beta_2 QL_i + \beta_3 \log[(K_i/L_i)^{00}/(K_i/L_i)^{60}]$$

$$+ \beta_4 [Ed_i^{00} - Ed_i^{60}] + \varepsilon_i , \quad (6)$$

Where the parameters β_j are estimated using ordinary least squares (OLS) using the available data set, and where ε_i is an error term that satisfies the standard OLS assumptions.

Equation (6) has been estimated using a sample of 62 countries for which information was available in the period of 1960 to 2000. The dependent variable is the growth (log change) of GDP per worker between 1960 and 2000 (expressed in constant, 1985 international, PPP-adjusted US$). The sample mean for this variable is 0.78, which is equal to 1.97% per year. The explanatory variables include, first, growth of capital per worker between 1960 and 2000. These data were obtained from Bosworth and Collins (1993) and Easterly and Levine (2001). The sample mean for this variable is 1.07, which

is equivalent to 2.9% per year. The second explanatory variable is the change in the average years of schooling of the workforce, which was obtained from Barro and Lee (1994, 2000) and Bosworth and Collins (2003). The sample mean for the change in years of schooling between 1960 and 2000 was 3.23 years and the mean value for the percentage of the labor force who had achieved some tertiary education in 1960 (HC_i^{60}) was 2.9 percent. The quality of schooling variable, QL_i, was measured using the index developed by Hanushek and Kimko (2000, appendix) and it represents the average quality of schooling of the labor force in the period of 1960 to 1990. The index ranges from 0 to 80 and the sample mean was 45.8.

Table 1A shows the results of the empirical analysis. The first column presents the estimated coefficients of the multivariate linear regression model shown in equation (6) excluding the quality of schooling variable. The coefficients of the capital accumulation and the change in years of schooling variables are both statistically significant at a 99 percent level of confidence. The coefficient on the initial level of human capital (in 1960) is statistically significant at the 90 percent level of confidence. These results suggest –in contrast to some of the earlier literature in this field—that education has a strong impact on economic growth, both through its effects as a factor of production across various sectors of the economy (represented by the coefficient on the variable Ed_i^{00}- Ed_i^{60}] and also as a factor in the research and development and technology sectors of the economy (reflected in the coefficient on the variable HC_i^{60}).

These results can be used to provide a rough, numerical estimate of how increased investments in schooling give rise to greater economic growth. If the average schooling of a country wee to rise by one standard deviation (which is approximately equal to one

year of schooling), the growth of per-capita GDP per worker would rise by 0.15 during the period of 1960 to 2000, which is equal to approximately 0.375 percentage points per year (0.15/40). If in addition the average schooling of the workforce who has achieved some tertiary education in increased by one standard deviation, which is equal to 7 percentage points (in the sample of countries utilized, the rise would be from 2.9 percent to 9.9 percent), growth of GDP per capita would increase by 0.1438 points between 1960 and 2000, which is equal to 0.36 percentage points per year (0.1438/40). The sum of these two effects is equal to 0.74 percentage points per year. This increase in economic growth is connected to the sum of the direct impact of increased schooling as a factor of production and the effect of increased education through its connection to technological change and innovation (total factor productivity growth). Note that the latter effect represents a causal impact of education on growth and can be associated with a virtuous growth cycle. That is, additional schooling causes increased technological change that then raises economic growth, which allows increased investments in education, which then further raises economic growth, etc.

The discussion so far has been based on the results reported in column one of Table 1A, which does not include the quality of schooling variable. Column 2 presents the results of the analysis when the quality of schooling variable, QL_i, is added to the equation, but taking the initial human capital variable out. The reason we take the HC_i^{60} variable out of the equation is because it is highly correlated with QL_i. That is, countries that have a larger proportion of their workforce achieving the tertiary education level also have primary and secondary school systems that have higher quality. As a result, when

the two variables are included in the equation together, both of them lose some statistical significance.

What the second column of Table 1A shows is that quality of schooling is a strong determinant of economic growth. The estimated coefficient on the variable QL_i is statistically significant at the 99 percent confidence level. Furthermore, the capital accumulation and increased schooling variables continue to be statistically significant influences on growth. Numerically, if there is an increase of the quality of education index of one standard deviation (12.6 points in the Hanushek-Kimko index), holding constant the quantity of education, then the impact on growth of GDP per capita is equal to 0.3 percentage points. Column (3) in Table 1A confirms the strength of quality of schooling in influencing growth, even when the quantity of schooling in 1960 is added to the equation.

The implication of this analysis is that countries that invest in raising both the quantity and quality of education of their workforce can expect to have significantly higher rates of growth of GDP per-capita, holding other things constant.

Table 1A

The Determinants of Growth in GDP per Capita between 1960 and 2000
In a Cross –Section of Countries

Dependent Variable: log change of GDP per worker: $\log[(Y_i/L_i)^{00}/[(Y_i/L_i)^{60}]$

Explanatory Variable	(1) Coefficient	t	(2) Coefficient	t	(3) Coefficient	t
Constant	-0.1875	-1.1	-0.4974**	-2.4	-0.4927**	-2.4
$\log[(K_i/L_i)^{00}/(K_i/I_L)^{60}]$	0.4052*	8.1	0.3927*	8.2	0.3937*	8.2
$Ed_i^{00} - Ed_i^{60}$	0.1488*	3.1	0.1301**	2.9	0.1343*	2.9
HC_i^{60}	2.0546***	1.7	--		0.6096	0.5
QL_i	--		0.0097*	2.9	0.0089**	2.3
N	62		62		62	
R-squared	0.61		0.64		0.64	

* Statistically significant at a 99% confidence level.

** Statistically significant at a 95% confidence level.

*** Statistically significant at a 90% confidence level.