EDUCATIONAL PROGRESS IN SUB-SAHARAN AFRICA: A COMPARATIVE HISTORIAL COMPENDIUM OF THEORY AND EVIDENCE

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Abstract: Thinking education could boost their economic well-being, many Sub-Saharan nations (in collaboration with multinational and bilateral donors), have devoted, and continue to devote a lot of treasure and effort towards education. Despite the huge sums of government donor provided funds that are being allocated to education, these countries still languish in their ability to catch up with the rest of the world in economic development. It might be due to this lack of economic success within the SSAs why there is a lack of consensus among professionals regarding the link between economic growth and education. That is, several studies have indicated both a lack of and positive association and between economic growth and the rate of growth of education (human capital) measured using alternative methods. In this paper, we test the hypothesis that education has a positive impact on growth but with significant country variation. Using cross-section panel data regression, we find positive correlations between growth and various definitions of human capital. We also update previous work and present several comparative historical indicators to measure progress (or its lack of) in education among the SSAs.

I. INTRODUCTION

"The requirement for faster development of the new nations in Africa… is more education and training at all levels-a more generally literate working force, more skilled artisans, more members of the learned professions, more entrepreneurs, more skilled government administrators. Until the human resources of the new African nations are more fully developed- and no huge injection of money can greatly accelerate the process-the opportunities for the wise and effective utilization of foreign investment will necessarily remain limited."

As advocated by Eugene Black and others, one would expect investments in human capital (education) to be one of the cornerstones for achieving a desired level of economic development for any country in the world, particularly developing economies of sub-Saharan Africa.

Some of the rationales behind the above claim are that, among other things, education helps firms and the national economy to be more efficient, competitive and productive by making the labor force to be relatively more flexible; it allows scientific knowledge and technological innovations to penetrate and nations to "move-up the ladder" from less skilled and labor-intensive activities to high-skilled and capital intensive activities. This is because only an educated labor force is capable of adopting more to changes quicker whenever situations demand it than the uneducated labor force. Furthermore, an educated labor force communicates better and enables nations to absorb the imported technology that perform some production processes requiring sophisticated operations. Education also fosters positive externalities by encouraging individuals and households to share the stakes of the country; it increases the behavioral benefits such as a reduction in fertility rates, the incidence of communicable diseases, infant and child mortality rates, enhancing tolerance, political stability and democracy. In summary, a productive human capital is an important ingredient for decreasing poverty, raising per capita income, and sustained improvements in standard of living.

In a micro context, education allows individuals to acquire skills that command higher wages; it enables them to perform more complex and sophisticated tasks rather than standard ones; adapt to the latest technologies and production practices; become more mobile and more entrepreneurial. Education may also play a role like saving by increasing the accumulation of human capital. In addition, it reduces the dependency burden of a given population, enhances greater physical investment and productivity.

Moreover, as the World Bank's 1993 study indicated[ii], the experiences of Southeast Asian countries such as South Korea show that investing in human capital is just as important, if not more, as a complementary factor contributing to the benefits of injecting money through foreign investments. Another macro level effect of education is its likely attraction of foreign investors, for foreign investors would prefer to invest in countries with higher quality of human resources than would be otherwise. Therefore, higher human capital increases the flow of foreign direct investment and enhances the competitiveness of developing nations. Most development experts agree with these conjunctures[iii], and, as a result, international organizations such as the World Bank and the United Nations have devoted huge sums of resources towards education. Such institutions and leaders of many developing countries believe education to be paramount for a comprehensive development and poverty alleviation.

However, in addition to being extremely costly, there can be cases in which more investments in education may not lead to a higher level of output per worker. This can be due to several distortionary factors, some of which are: a lack of labor demand and inappropriate development strategies and policies geared towards import substitution industrialization.

In the case of the lack of labor demand, what needs to be realized is that education leads to the creation of a supply of educated and skilled workers available to be utilized in the economy through the force of labor demand. If there is no labor demand, then an economy ends up with a pool of unemployed resources that could have been used to increase productivity. As a result, human capital becomes inefficiently used with no or minimal effect on potential economic growth. Moreover, an excessive expenditure of resources on education in the face of a lack of labor demand may lead to the **"brain drain"** phenomenon, a fact that many developing nations face today. For example, as Easterly (2001)

notes, an estimate shows that 77% of university graduates in Guyana immigrated into the United States. Even if there is a labor demand in the form of a government guarantee of employment for the educated in the public sector, compensation mechanisms may not be shaped to reward effort. Consequently, workers may lack apparent incentives for working up to their potentials, causing productivity to fall. Pritchett (1997) shows that when governments over-employ the educated labor in the public sector, growth in output per worker is reduced by as much as two percentage points a year. He also suggests that the lack of correlation between education and growth could be explained by the excess supply, weakness of institutions and low quality of education.

Development strategies such as import substitution industrialization (ISI) may also result in the underutilization of the available pool of educated workers. With ISI strategies, domestic firms face less foreign competition in the domestic market, thereby creating less incentive to innovate, possibly leading to the inefficient utilization of the educated and skilled workers. Furthermore, once government policies focus on protecting local industries from foreign competition, industrialists assign their best people to lobby for more protection, a result known as increased rent-seeking behavior. This behavior is known to reduce incentives and enhance corruption. Under such an environment, which is inimical to growth, the benefits of promoting education may not seem to justify its costs[iv].

II. A BRIEF REVIEW OF THE LITERATURE

Benhabib and Spiegel (1994) argue that initial levels of education allow nations to absorb imported technology and improve economic wellbeing; specifically, they find a positive and significant relationship between the initial level of education and subsequent productivity growth. They also report a negative association between GDP growth and the growth rate in years of schooling.

Pritchett (1997) finds a lack of association between growth in education and growth of output per worker. Using Barro-Lee (1993) and the Nehru-Swanson-Dubey (1994) (N-S-D) education data, he shows that physical capital per worker has a positive and large impact on the growth rate of output per worker (positive and large physical capital per worker coefficient), while the coefficient for educational capital's contribution to the growth rate of output per worker was negative and not statistically different from zero. However, Krueger and Lindahl (2001) doubt the reliability of Pritchett's findings. Krueger and Lindahl suggest that Pritchett's results cannot be trusted for their findings involve a measurement error in educational attainment.

Bloom, Canning, and Chan (2006) argue that tertiary education may allow for quicker technological-catch-ups and higher level of output. Mankiw (1995) finds that nearly 80% GDP growth can be accounted by a combined increase in both physical and human capital. His study implies that countries with the same technology could have income variations among them due to differences in human and physical accumulation.

Lau, Jamison, and Louat (1991) examine the impact of primary and secondary schooling on growth in five regions. Their results show that that primary schooling has a negative effect on growth in Africa and the Middle East, even though the effects seemed to be insignificant in South Asia and Latin America with positive and significant effect in East Asia.

A study by Judson (1993) revealed that primary schooling seems to have a positive impact on growth, in contrast to secondary and tertiary education, which has no significant effect on growth. Additionally, Barro and Sala-i-Martin (1995) find no correlation between growth per capita, and secondary and tertiary education, while studies by Behrman (1987), and Dasgupta and Weale (1992) show that changes in adult literacy rates are significantly correlated to changes in output.

Bils and Klenow (2000) argue that the correlation between schooling and growth is weak. However, Romer (2000) argues that the impact of education on economic growth is not determined by the amount of expenditures but by the quantity of inputs used in R&Ds.

This paper examines the contribution of education to the economic growth of sub-Saharan Africa using alternative measures of education, among them being primary and secondary schooling enrollment ratios, literacy rates, and an alternative measure of human capital: the product of life expectancy at birth. Our empirical methods are different from other works in at least three ways: 1) our data involves more countries compared to the limited number of countries used in the previous literature. Our use of many sources of data have also enabled us to use a time series that spans for longer time periods compared to what has been used in the past. 2) Our use of alternative data sources has also allowed us to utilize a longer time series data in our regression analysis. 3) We apply the panel data fixed effects model and the pooled time-series cross-section regressions to account for the individual country variations and characteristics. Our research is different from others in that it focuses solely on sub-Saharan Africa. The model we use is a variant of the augmented Solow model proposed by Mankiw, Romer, and Weil. Specifically, the model follows the one used by Barro (2001). To our knowledge, no one has used such extensive and alternative models to garner our understanding of public education on economic growth. Our results endorse the hypothesis that human capital is positively correlated with per capita income growth rates. The results obtained are robust in the sense that the positive correlation involves four alternative measures of human capital.

Numerous studies and some of the summary statistics we present below also indicate that access to education, albeit unsatisfactorily, has been increasing in SSAs. However, a 2007 World Bank on quality of tertiary education indicates that quality has been compromised (for countries which include Ethiopia), some the factors for the decline being "... decline qualified academic staff in higher education institutions as the result of brain drain, low internal and external efficiency; and poor governance."

The rest of the paper is organized as follows: Sections III and IV present the stylized facts on the educational attainment and economic growth of Sub-Saharan Africa using graphical methods. Section V provides the empirical analysis regarding education's contribution to the economic growth of Sub-Saharan Africa. This section begins with a brief explanation of our data and the sources. It then proceeds in presenting the model used to generate our empirical results. Section VI concludes.

III. GRAPHICAL PRESENTATION OF THE STYLIZED FACTS: AN OVERVIEW OF VARIATION ACROSS COUNTRIES

Data

We assembled a time-series data involving 39 Sub-Saharan countries[v] and 31 years (1975-2005) for the empirical part of our analysis. We used different data sources, including the on-line version of the World Bank's World and Africa Development Indicators, Different versions of the World Bank's Africa Database on CD-ROM, the CD-ROM version of IMF's International Financial Statistics, and the United Nations and its affiliates' online databases, UNESCO's Institute of Statistics (UIS database), Africa Development Yearbook 2010 and other online available data sources.

Figures 1-7 present the stylized facts regarding economic growth and educational attainment involving a subset of the countries in our sample, and occasionally all the countries used in our empirical investigations. In Figure 1, we use the average GDP growth rates during the period 1986-1995 for some of the individual countries. The figure shows that some countries experienced negative average GDP growth rates during the period 1986-1995, while others enjoyed positive economic growth. The same World Bank data also indicates that only Botswana, Ghana, and Lesotho experienced consistent positive annual growth rates while the remaining 15 countries experienced both positive and negative annual growth rates from 1986 to 1995.

We use per capita income growth rates, both across time (1960-2002) and across a majority (39) of the SSAs in Figure 2. Figure 2 clearly shows that, the SSAs, as a group had faced negative per capita growth rates in the mid 1980s and early to mid 1990s. Both figures indicate significant variations across many countries. This fact would be important for what kind of empirical methodology has to employ in the estimation process.

Furthermore, the 18 Sub-Saharan African countries in Figure 1 also exhibited significant variations regarding education, as evidenced by the primary and secondary coverage shown in Figures 3 and 4. We use variable primary school enrollment measured in percentage gross as a proxy for the primary coverage. This variable is obtained from the World Bank's World Development Indicator (WDI). According to the World Bank definition, percentage gross primary school enrollment is "the ratio of total enrollment regardless of age, to the population of the age group that officially corresponds to the level of education shown." Using this definition, Figure 3 presents a graphical depiction of the primary coverage of 18 Sub-Saharan African countries in our sample, using 1975 as the initial year. As the figure shows, countries such as Kenya, Lesotho and the Republic of Congo had an initial primary coverage exceeding 100% in gross terms. This is due in large to the way primary coverage has been defined. This variable includes students whose ages do not correspond to the primary level education, perhaps due to repetition, and are actually attending primary schools. Because of this fact, the overall primary enrollment could exceed the total number of students whose age group corresponds to the primary level education. On the other hand, countries such as Niger, Burundi, Sierra Leone, Senegal, and Sudan had a primary gross coverage of less than 50%. Furthermore, the average of the initial (1975) primary coverage was 68.83%, an expected result given the fact that most of the countries in Figure 3 had an initial primary coverage greater than 50%. The standard deviation was 31.89, indicating significant deviation from the mean.

As shown in Figure 4, the change (in percentage points) in primary coverage measured by taking the difference between the primary coverage in 1975 and 1980 does not seem to exhibit significant variation. The mean of this variable is 7.28 with a standard deviation of 7.59. Overall, this specific variable indicates no significant variation in terms of progress in primary coverage between 1975 and 1980.

The World Bank data also shows the secondary coverage, which is obtained from secondary school enrollments measured in percent gross and is defined by the World Bank as "the ratio of total enrollment regardless of age, to the population of the age group that officially corresponds to the level of education shown." As Figure 5 indicates, the secondary coverage in 1975 was relatively lower than that of the primary coverage during the same year as exhibited in Figure 3. In fact, none of the countries in Figure 5 had a secondary coverage greater than 50%. That is, secondary coverage in 1975 for the 18 countries is relatively lower than the primary coverage. This could be attributed, in part, to the fact that some students whose age corresponds to secondary schooling maybe attending primary schools. Therefore, this makes the ratio of total enrollment regardless of age, to the population of the age group that officially corresponds to that level of education to be less than 100%. Moreover, Figure 5 shows

significant variation across countries in the secondary coverage due to the relatively high coverage of Ghana and the Congo Republic (greater than 35%), while the remaining 16 Sub-Saharan countries attained a coverage less than 20%.

We can also look at the change (in percentage points) in secondary coverage (obtained through getting the difference in enrollments between 1975 and 1980). The mean for the 18 countries was 5.33 with a standard deviation of approximately 6.28. This deviation from the mean is relatively higher than that for the change (in percentage points) in primary coverage. Figure 6 shows the change (in percentage points) in secondary coverage from 1975 to 1980 and the initial secondary coverage (1975).

Figure 7 shows that for the majority of the countries in the figure itself, the percentage point change in primary coverage from 1975 to 1980 is significantly and relatively higher than that of the secondary coverage. However, when the change in coverage is measured in terms of percentage changes, the percentage change in secondary coverage exceeds that of the primary coverage. This is attributed to the fact that the primary coverage in 1975 was relatively higher than the secondary coverage during the same year, and so an equal increase in enrollment on the primary and secondary level will be translated into a relatively higher percentage increase for the secondary than for the primary coverage. In other words, using percentage change instead of percentage point change to measure progress in coverage assigns more weight to countries that have started from a relatively lower base, giving the impression that countries have dramatically increased their coverage.

IV. COMPARING EDUCATIONAL ACHIEVEMENTS OF SUB-SAHARAN AFRICA AND ETHIOPIA

In this section, we use common education indicators to see the overtime progress that the Sub-Saharan region (SSA) and Ethiopia while at the same time comparing the two. Both Ethiopia and the entire region of Sub-Saharan Africa face daunting problems when it comes to education on many fronts.

When comparing and evaluating national and regional education programs, the stylized methods used by UNESCO, the World Bank and other multilateral institutions are summarized by the issues of access, accountability, equity, and quality/relevance. Several indicators have been developed as measures the above four categories by the aforementioned institutions, policymakers, experts and individuals. For example, some of the indicators used to measure **access** to education include, among others include: Gross and Net Enrollment Ratios at various educational structures, progress in participation rates and in adult population literacy rates**,** gross (apparent) intake rates (AIR), School life expectancy.

Various indicators are (and could be) used to address the question of **equity**. Some of these include disparities in enrollment ratios between female and male students, particularly the Gender parity index, gender and regional attrition (repeating and survival) rates, disparities in adult literacy rates between males and females, participation ratios in primary and secondary education by gender, region and even ethnicity, and their financing disparities. It is also common to use disparities in average class size, assessment results, course availability, expenditure per pupil, pupil-teacher ratios, quality of school facilities, availability of schools supplies, teacher education level, rural-urban disparities in access to education and financing.

Proxy measures for **accountability** include compliance with statutes and regulations provided by authorities and regulators, adherence to professional norms, and commitment to good results and effective use of resources (financial, physical and human). Accountable educational systems and provisions must layout clear objectives of their educational services by developing curriculum and goals and appraising

them on a continuous basis (scrutinized by outside evaluators.) Implementation of acceptable and standardized assessment measures of excellence (such as board certified exams) and establishment of reputable accreditation systems should also be in place. Various student achievements, employability, a means to compare initial salaries of graduates by institution and relevance of what is being taught are also important.

Some of the proxy indicators to measure progress in **quality and efficiency** include class size, pupil-teacher ratios, per capita budget expenditures, student achievement test results which should be compared with students achievements in other parts of the world (regions); availability of trained teachers, books and necessary teaching aids, equipment and school supplies, dropout rates and class repetition rates, progress made in the certification of teachers, etc. Other important but difficult to quantify measures of quality may include parental and community involvement in children's education and collaboration among parents, community, teachers, educational institutions and authorities. Teacher certification rates and their methods of evaluations could also be used. In addition to being used as measures of access, literacy rates and standardized exams (both nationally and internationally) are also as measures progress and educational quality. Efficiency is examined through students' dropout rates and repetition of classes.

Even though both the Sub-Saharan region and Ethiopia have been making progress in a number of fronts, several studies have indicated a multitude of the same problems that they have faced continue to persist. Several indicators show the region lags behind all the regions of the world. Educational achievements in Ethiopia lag behind nearly all countries in the world. Numerous indicators variables such as enrollment ratios, gender and regional disparities at all levels enrollments - the disparities being particularly at the tertiary levels- high and continuous female drop-out rates are some of the common characteristics that Ethiopia shares with Sub-Saharan Africa.

Among the four major categories, the problem regarding quality is known to be acute, particularly at the tertiary level. According to the World Bank, some of the culprits behind the declines in quality are declines in educational financing (as evidenced by from an average of about US$6,800 per student annually in 1980 to US$981 in 2005 in most African countries), declines qualified academic staff, brain-drain, poor governance structures and inefficiencies. An undated (recent) USAID study shows (http://www.equip123.net/docs/e2-SecondaryExpansionSSA_WP.pdf) estimates the gap between the supply of qualified teachers and their demand to be alarmingly high for many years to come. Quoting UNESCO Institute for Statistics (UIS) and World Bank as its sources, the same USAID study shows that the SSAs need recruit close to 1.4 million new teachers between 2000 and 2015 in order to meet the shortfall for primary teachers. Ethiopia faces similar problems as well. In the words of Vice Minister for Higher Education Yizengaw (2005), "At the start of the 21st century, Ethiopia's higher education system is still traditional or conservative in its academic orientation and poorly connected with national development requirements and hardly meets international standards." [P. 5.]

As Table 2 and Figures 8-10 show, both the region and Ethiopia are making progress on all fronts, particularly regarding the issue of access. Despite the progress that has been made such as steady rises in enrollment/attendance rates at all structure of the educational levels (and with greater numbers of students

completing their primary and secondary education), all the available data indicates that Ethiopia stands close to the bottom in educational achievements. As Lasonen, Kemppainen and Raheem (2005) even "… access to education [in Ethiopia] has been among the most limited in Africa". For example, Using UNESCO's and World Bank's statistics, NationMonster.com file:///K:/education/africandata/educationdata/et-ethiopia.htm reveals that Ethiopia's secondary and tertiary enrollments stand at about 12.7 and 1.6% , respectively [126th out of 135 and 138th of 150 countries, respectively], school life expectancy is 4.3 years [104th of 110 countries, the highest ranked country, Norway being 16.9 years], total population literacy rate of 42.7% [191st out of 205 countries], primary schooling pupil-teacher ratio of 72.8 (4th out of 191 countries, only war-torn countries such as Afghanistan and the Republic of the Congo and Central African Republic being worse than Ethiopia]. The teacher-student ratios even at the university level are alarmingly high, growing from 1:8 in 1995 to 1:15 in 2009/2010, according to the study made by Reisberg and Rumbley (2010.), the deterioration in quality is exacerbated by not only shortages of qualified teachers and staff, but also by *the* constraints in infrastructure such as classroom space, expansion of library collections, addition of computer labs, even power black-outs.

The most disturbing aspect of the Ethiopia educational delivery system is the issue of quality. The expansion of private education and higher public expenditures to finance the demands for secondary and tertiary education contributes to the quality deterioration of the educational system. In order to ease the challenges and persisting problems, the current government has used several ways to address particularly the issue of access to education. In addition to favorable policy changes, donor funds, the introduction of student cost-sharing and cost recovery schemes and the delivery of educational services by the private sector are contributing of increased access of education. Many researchers representing several organizations have reported the decline in quality is both systematic and endemic. As indicated by study of Reisberg and Rumbley (2010), quality deterioration should be expected when governments give more priority to the issue of access and equity. Dr. Tesfaye Teshome, Director General of Higher Education Relevance and Quality Agency (HERQA) and his collaborator, Mr. Kassahun Kebede, MA, Senior Quality Expert in Quality Assurance and Enhancement Section of HERQA, also seem to be very concerned about the quality problems surrounding the Ethiopian educational system. According to Teshome and Kebede, quality assurance in higher education institutions problems arise partly due to the lack of expertise in quality-related processes and lack of human capacity. Nonetheless and despite the difficult opportunity costs involved in making choices, establishing robust and comprehensive quality assurance systems is extremely important!

V.   OUR EMPIRICAL FINDINGS ON THE RELATIONSHIP BETWEEN EDUCATION AND GROWTH FOR THE AFRICAN REGION

Methodology

Overall, the figures presented in the earlier section suggest the existence of significant variations among countries both in terms of economic growth and educational attainment measured in terms of primary and secondary school enrollment rates. It is important to recognize, however, the SSAs not only

exhibit variations in their growth rates but in their differences in individual country characteristics. Therefore, in order to account for other important variables that may possibly influence growth such as the amount of physical capital present to each country, and also consider individual country characteristics such as physical and human capital combined, we use the panel data fixed effects model and the pooled time-series cross-section regressions. Furthermore, the model we use is a variant of the augmented Solow model proposed by Mankiw, Romer, and Weil. Specifically, the model follows the one used by Barro (2001):

$$Dy_{it} = F(HK_{it}, X_{it}),$$ **(1)**

where Dy_{it} represents per capita income growth rate for each country i and in period t, HK_{it} represents a set of human capital variables for country i at time t and the vector X_{it} represents a set of control variables for each country i at a certain time period t (see below). The actual regression results obtained in Table 1 are based on the following model:

$$Dy_{it} = \beta_0 + \sum_{m=1}^{5} \beta_i (HK)_{it} + \sum_{j=1}^{k} (\gamma_i X_{it}) + \varepsilon_{it}$$ **(2)**

where, Dy = per capita growth of GDP, the subscript m represents various measures of human capital (HK), specifically: average years of schooling, or school life expectancy-YRSCHOOL; the literacy rates for each country-LIT; the primary and secondary enrollment ratios measured over time and for each country (PENROL and SENROL, respectively), and a product of life expectancy at birth and average years of schooling-HUAMN). The subscript j and the vector **X** represent other control variables such as the Investment/GDP ratio proxied by the gross capital formation to GDP ratio-IGDP; the inflation rate of each country as a measure of macroeconomic instability-INF; the international openness index-OPEN; the growth rate of population as measure of the growth for labor-POPG; and the domestic interest rate-INT.

The theory of growth accounting implies that human capital should be included in growth rate regressions. We performed a panel-data-cross-section regression using the per capita GDP growth rates as the dependent variables and aforementioned (same) set of independent variables[vi]. We used this methodology to account country specific effects (such as differences in initial levels of income, technological levels, country specific shocks, educational policies, etc.) Moreover, we employed five methods of measuring human capital for at least for the following reasons: as many authors (see, Todaro and Smith, 2006, for example) indicate, on a micro level, the rate of return to primary education is many times greater than the rates of return to secondary and tertiary education. On the other hand, the cost of secondary and tertiary education is nearly 100 times the cost of primary education. For this reason, many, including the World Bank and UNESCO advise developing nations to expand educational opportunities to all citizens on primary levels. Implicit in this suggestion is that the contribution of primary education on economic growth is superior to that of secondary and tertiary education. On the other hand, emphasizing the importance of quality over quantity, Romer (1993) is in the opinion that higher level of education, especially the one based on R&D is what matters, not the quantity of education. This line of thought believes that it is the highly skilled labor force that which can tackle sophisticated levels of production activities. Our use of alternative, including secondary education addresses the question of that all levels of education positively contribute to per capita income growth.

We present our separate growth regressions in Table 1. The first of this is the literacy rates of each country. The second one is a measure of human capital as used by Osborne (2004) which is a product of life expectancy at birth and average years of schooling. The third and fourth variables are the primary and secondary enrollment ratios, respectively. The last one is the average years of schooling. As implied by the growth accounting theory, the results presented in Table 1 indicate that all five measures of human capital are significantly and positively related with per capita income growth. Table 1 also indicates that the investment/GDP ratio and the international openness index are positively related with per capita income growth rates and have the expected sign, regardless of which measure of human capital is used. The inflation and interest rate variables are not statistically significant but have their expected signs. The negative and at times the significance of the population growth variable may reveal that this variable is deleterious to per capita growth in sub-Saharan Africa[vii]. We examined the results we obtained after updating the data set to include the latest years and information. We find that there are no qualitative changes regarding the panel-data-cross-section regression results.

VI.   SUMMARY AND DISCUSSION

Our time series empirical results clearly show that all five measures of human capital have positive causal relationships with per capita GDP growth rates. The results we obtained are in contrast to some of the previous literature, which found no relationship between human capital and economic growth. In our analyses, we used these variables as investments, in a macro sense. We used alternative measures of human capital to show the robustness of results.

Coming back to the issue we raised: given the huge expenditures made by the governments of the SSAs, the World Bank and the United Nations, does this expenditure has the intended macroeconomic effects? Based on the empirical results we obtained, the answer to this question is a resounding "Yes." This positive response includes the importance of having access to all levels of education, including post elementary education.

However, the positive and significant relationships between the various measures of human capital and per capita growth do not mean that education alone determines economic development. There could even be bi-directional causality between growth and education. The argument for education is that increased education begets more skilled workers and more skilled workers increase productivity and growth in the end. Since increased education in LDCs, does not involve R&Ds, innovation etc., the positive correlation between per capita growth and expenditures on education may not be sufficient, even though it could be one of the necessary ingredients. Important variables such in-equality, equal participation of females, and institutional quality, even government educational policies may play very important roles. The sufficiency conditions may also depend on political and/or social complements. This may be why the literature is not unanimous on the contribution of human capital to economic growth. We know, for example, the SSAs differ in their approach to educational delivery and services. Some countries give relatively more emphasis on primary education. The educational policies of some members, such as Uganda, provide greater access to education to rural areas compared to some other countries, Ethiopia, for example. The policy which provides more access to education to rural areas could be more productive compared to the one which only focuses in urban areas. Unfortunately, the results obtained here are too general to identify such differences. Moreover, even though literature has almost unanimously has determined that the return to general education is greater than the return to specific (vocational) education, we do not know which of these human capital more important on a macro level[viii]. As a result,

continuous research is paramount in order to find a definite answer to link economic growth and human capital.

Despite the strong correlations between the various educational measures and economic growth in the SSA, many of the historical and comparative indicators reveal that educational deliveries and achievements in the SSA lag behind other regions and countries of the world. Other issues such as the lack of sufficient capital to work with, brain drain, lower educational quality and other macroeconomic problems that are particularly endemic to the SSA could play a factor for the potential lack of correlation between education and economic growth and for doubting the importance of human capital being a "settled issue" its role as factor in development. Given our empirical results, it is indeed re-assuring to find that education plays a role in economic development in developing counties.

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[i] Professor of Economics, Murray State University and Ph.D. student, George Town University, respectively.

[ii] World Bank, The East Asian Miracle: Economic Growth and Public Policy: New York, Oxford University Press, 1993.

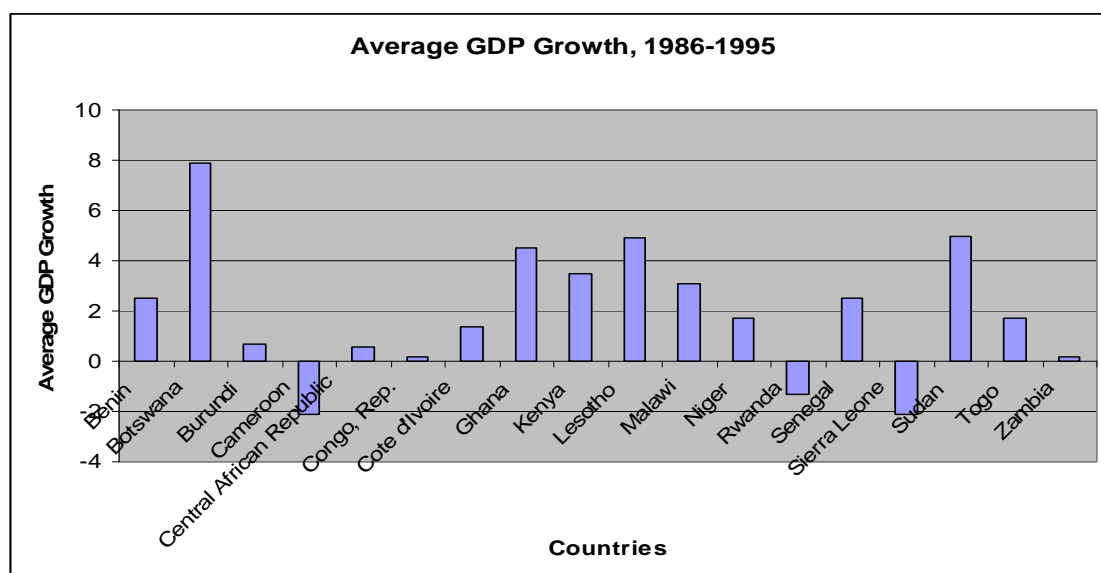[iii] See, for example, Li, Xiaoying and Xiaming, Liu, (2005), Romer, 1990.

[iv] It is also important to mention that it is not the quantity of education that matters the most, but rather the quality of human capital that is attained and how it is used in the process of enhancing productivity. The quality of education and the type of education are critical for growth.

[v] Benin, Botswana, Burkina Faso, Burundi, CAF, Cape Verde, Congo (Republic of), Congo (Democratic Republic), Central African Republic, Cote d'Ivoire, Cameroon, Chad, Ethiopia, Ghana, Guinea, Gambia, Gabon, Kenya, Lesotho, Madagascar, Mauritania, Mauritius, Mozambique, Malawi, Namibia, Niger, Rwanda, Senegal, Seychelles, Sierra ;Leone, Swaziland, Sudan, Togo, Tanzania, Uganda, Zaire, and Zambia.

[vi] The regression results from the panel-data –cross-section regression are available upon request.

[vii] Seminar participants and the referees wondered why the adjusted R-square in all models is so low. As it is known in, the times series application literature, the R-square values of first differenced and logged series are in fact always low. In this situation, one has to rely on the individual t-states and the overall fit of each model.

Figure 1

Figure 2

Fig. 2. GDP & per capita GDP Growth Rates

Figure 3

Primary Coverage (% Gross)

Figure 4

Initial and Progress in Primary Coverage

Figure 5

Secondary Coverage (% Gross)

Figure 6

Initial and Progress in Secondary Coverage

change (% points) in secondary coverage (1975-1980)

secondary coverage, 1975 (% gross)

Figure 7

Change in Primary & Secondary Coverage

Figure 8: Measures of Access

Figure 9: Indicators of Quality- Pupil-Teacher Ratio

Figure 10: Literacy Rates
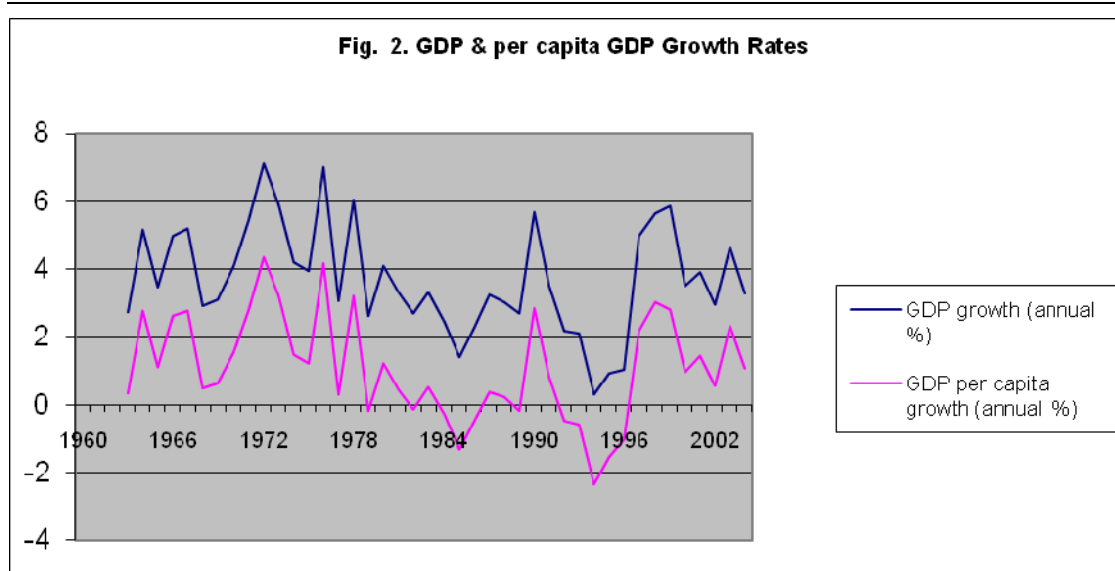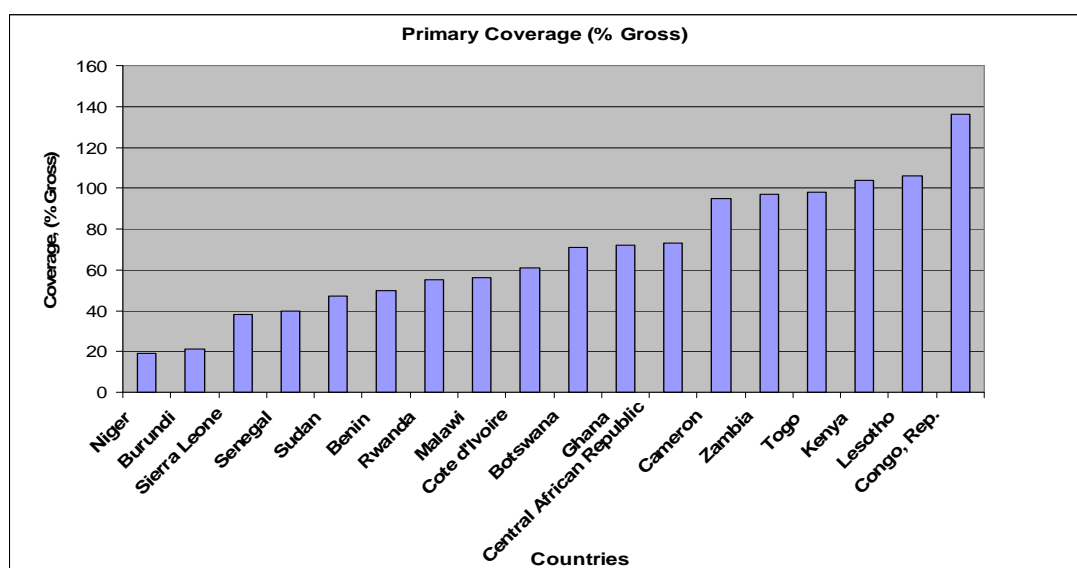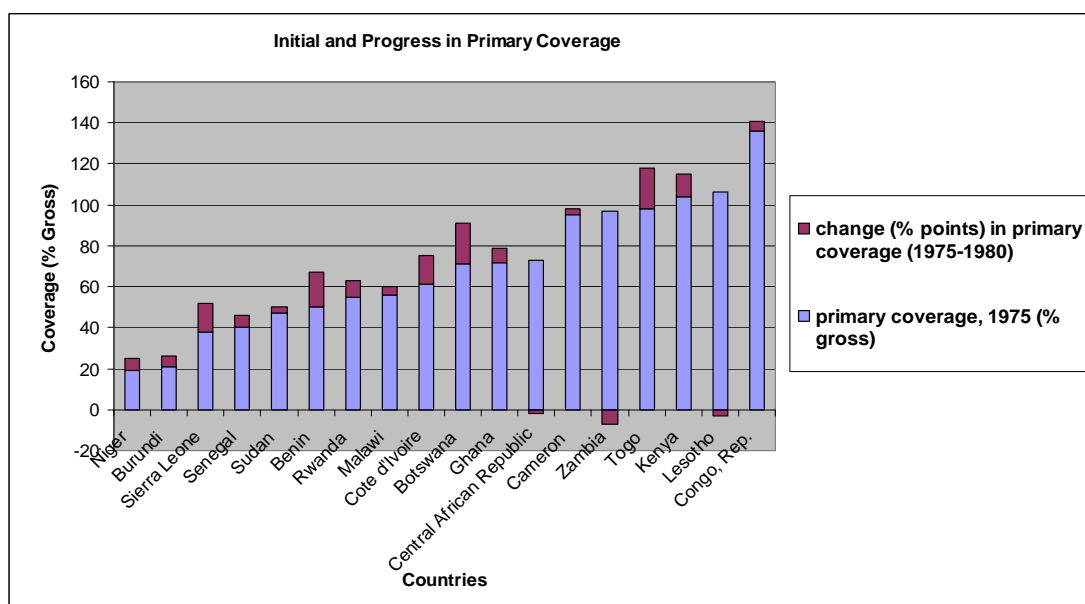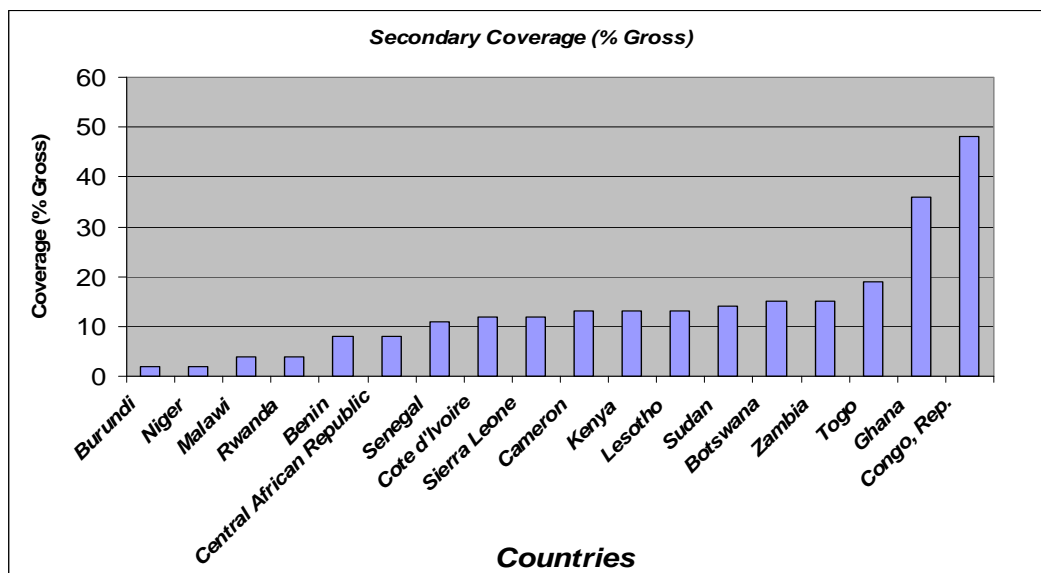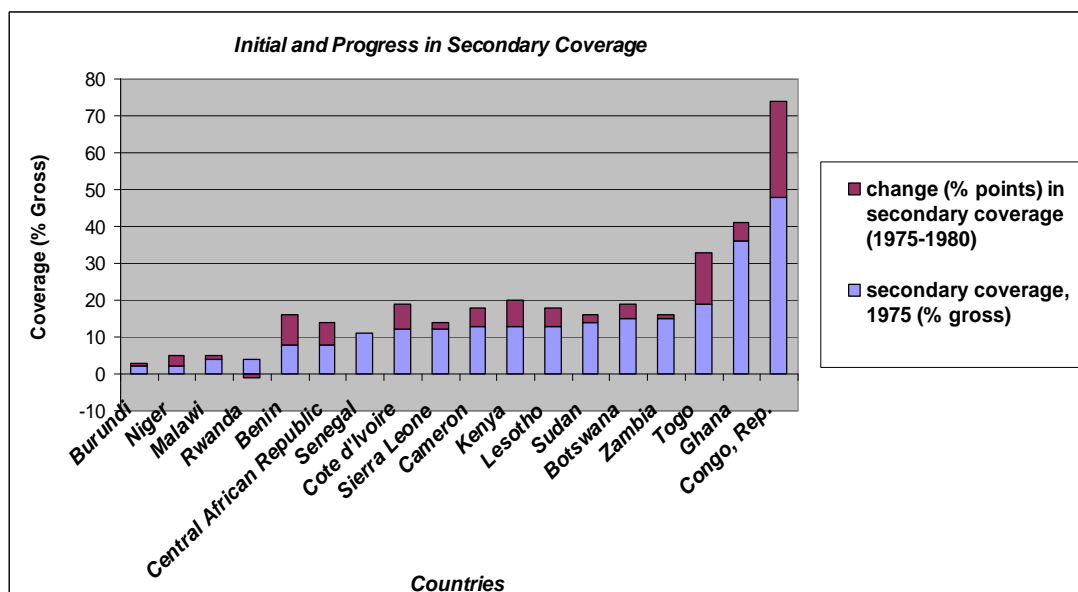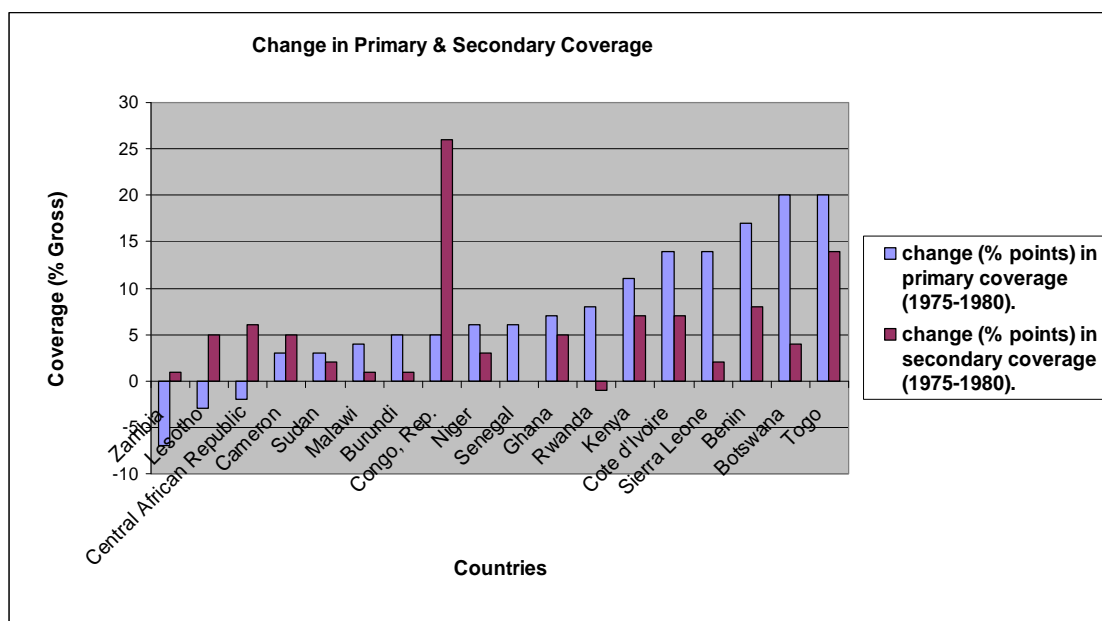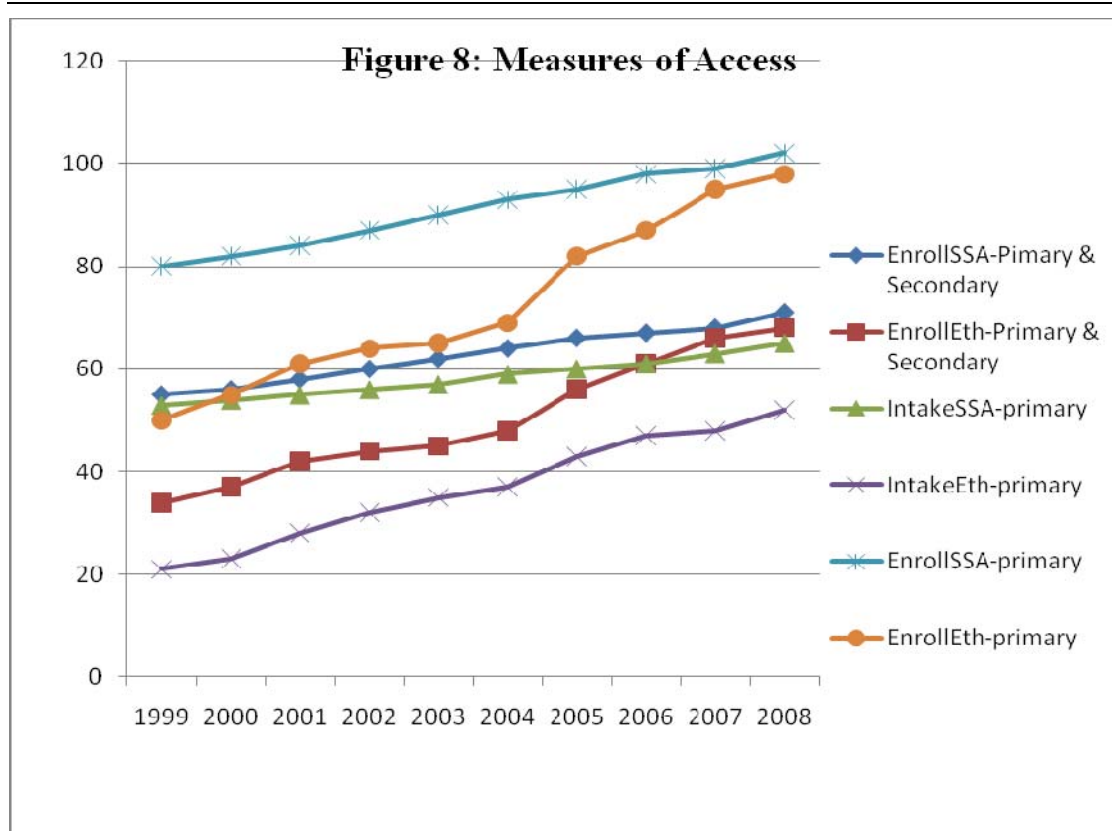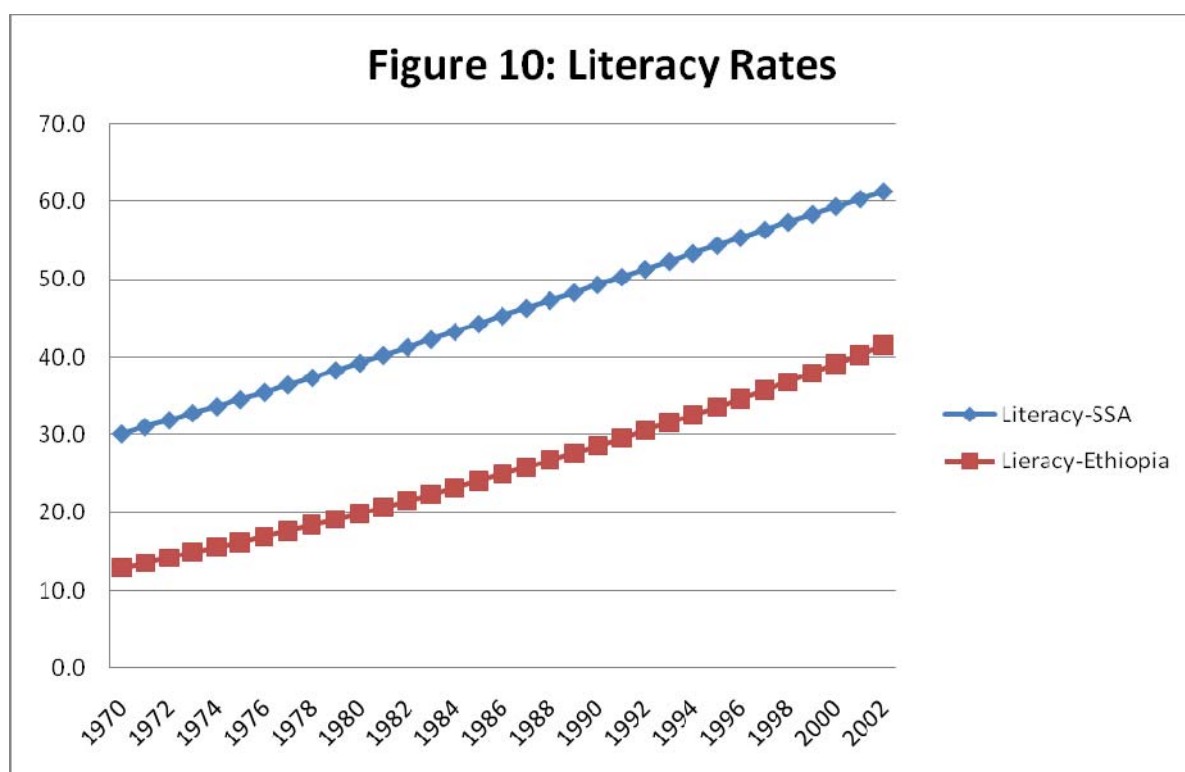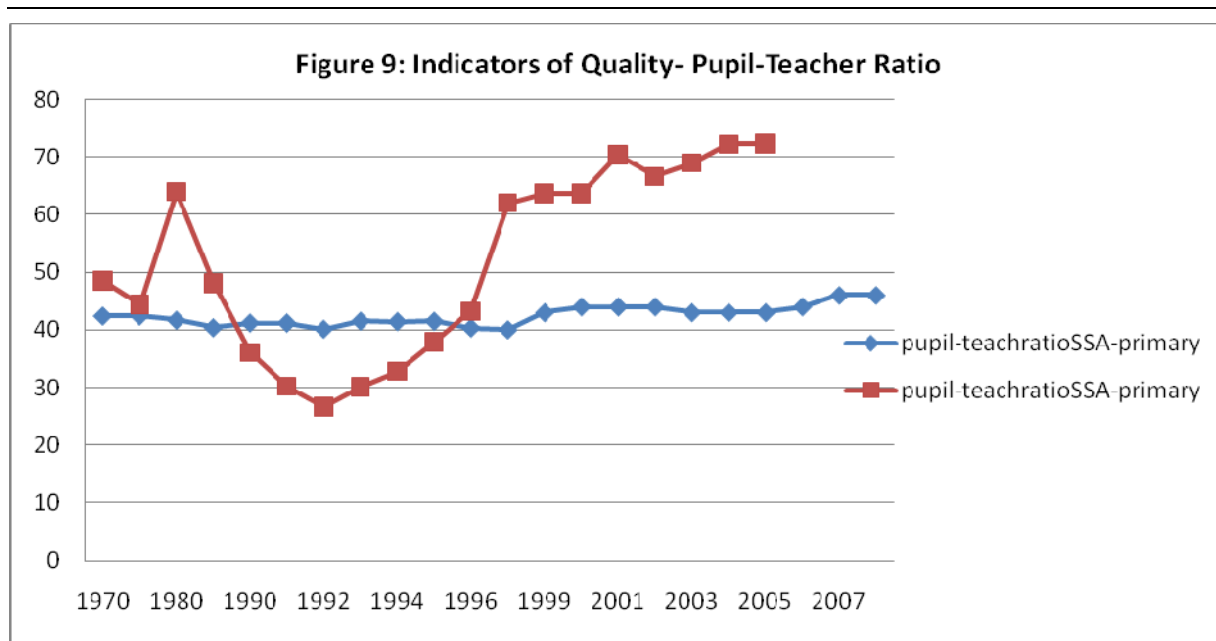
Table 1: Regression Results					
Variable	*Dependent Variable: Per Capita GDP growth*				
	Model_1- Literacy Rate	**Model_2- life expect*avg. year of schooling**	**Model_3- Primary Enrollment Ratio**	**Model_4- Secondary Enrollment Ratio**	**Model_5- Average Years of Schooling**
Constant	-9.16(3.05)	*-11.55(3.99)*	*-19.52(4.13)*	*-11.49(4.310)*	*-7.19(5.04)*
LIT	1.39(1.91)*				
HUMANK		*1.2(2.24)**￼*			
PENROL			*3.38(3.21)**￼*		
SENROL				*2.01(2.90)**￼*	
YRSCHOOL					*1.37(2.49)**￼*
IGDP	2.19(6.02)**	*2.45(6.2)**￼*	*2.05(4.34)**￼*	*2.15(4.51)**￼*	*2.46(6.2008*
INF	*-0.005(0.6)*	*-0.01(0.74)*	*-0.013(1.13)*	*-0.018(1.55)*	*-0.006(0.66)*
INT	*-0.007(0.27)*	*-0.02(0.77)*	*-0.011(0.03)*	*-0.012(0.33)*	*-0.02(0.740*
OPEN	*0.07(1.92)*￼*	*0.08(1.90)*￼*	*0.09(2.09)*￼*	*0.09(2.08)*	*0.08(1.90)*￼*
POPG	*-0.63 (3.91)**￼*	*-0.14(0.88)*	*-0.07(0.39)*	*0.033(0.18)*	*-0.10(0.6)*
	Plus 39 cross- country fixed coefficients	*Plus 39 cross- country fixed coefficients*	*Plus 39 cross- country fixed coefficients*	*Plus 39 cross- country fixed coefficients*	*Plus 39 cross- country fixed coefficients*
Durbin-Watson stat.	*1.88*	*1.997*	*2.19*	*2.18*	*2.00*
Adj. R^2	*0.11*	*0.08*	*0.07*	*0.07*	*0.08*
# of observations	*992*	*1082*	*707*	*700*	*1082*
Notes: 1) Absolute values of t- stats. Are in parenthesis; 2) (*), and (**) indicate significance at the 5% and 10% level, respectively.					

[viii] One of the referees emphasized this fact. We are grateful to two unanimous referees for bringing this issue to our attention and for their valuable comments.

Table 2 - Summary Educational Indicators Comparing Sub-Saharan Africa and Ethiopia												
year	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**		
Gross enrolment ratio. Primary. Total												
SSA	80	82	84	87	90	93	95	98	99	102		
Eth	50	55	61	64	65	69	82	87	95	98		
Gross enrolment ratio. Primary & Secondary combined. Total												
SSA	55	56	58	60	62	64	66	67	68	71		
Eth	34	37	42	44	45	48	56	61	66	68		
Gross enrolment ratio. All levels combined (except pre-primary). Total												
SSA	43	44	45	47	48	50	51	52	53	55		
Eth	27	29	33	35	36	38	44	48	52	53		
Gross enrolment ratio, Tertiary												
SSA	4	4	4	5	5	5	6	6	6	6		
Eth	1	1	2	2	2	3	3	3	4	4		
School life expectancy (years). Primary to secondary. Total												
SSA	6.5	6.7	6.9	7.1	7.3	7.5	7.7	7.9	8	8.2		
Eth	4	4.4	4.9	5.2	5.3	5.7	6.6	7.2	7.8	8.1		
Gross intake ratio to the last grade of primary. Total												
SSA	53	54	55	56	57	59	60	61	63	65		
Eth	21	23	28	32	35	37	43	47	48	52		
Adult Literacy Rates- both sexes												
year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	
SSA	55.4	56.5	57.5	58.5	59.5	60.5	61.5	62.5	63.5	64.5	65.5	
Eth	32.2	33.3	34.4	35.4	36.5	37.5	38.6	39.7	40.8	41.9	43	
year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
SSA	50.3	51.3	52.3	53.4	54.4	55.4	56.4	57.4	58.4	59.4	60.4	61.4
Eth	29.6	30.6	31.6	32.6	33.6	34.7	35.7	36.8	38.0	39.1	40.3	41.5
Public spending on education, total (% of GDP)												
	1990	1991	1995	1998	1999	2000	2001	2002	2003	2004	2005	2006
SSA		4.2		3.0	4.1	4.1	4.4	4.7	5.4	4.5		
Eth	2.9	3.365	3.3		4.26	4.721	4.672	4.593				5.53308
Primary pupil teacher ratio												
year	1970	1975	1980	1985	1990	1991	1992	1993	1994	1995	1996	1997
SSA	42.41	42.4103	41.6797	40.375	41.2059	41.2009	40.1309	41.5242	41.4485	41.501	40.33	

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	
Eth	48.5	44.3135	63.9432	48.0888	36.0752	30.1706	26.6105	30.1526	32.7529	37.8978	43.2	..
year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	
SSA	40.01	43	44	44	44	43	43	43	44	46	46	
Eth		63.6	63.6	70.3	66.6	68.9	72.2	72.3				
	Gender parity index for gross enrolment ratio. Primary & Secondary combined											
SSA	0.84	0.84	0.84	0.84	0.85	0.85	0.86	0.87	0.88	0.88		
Eth	0.62	0.65	0.68	0.69	0.69	0.73	0.77	0.8	0.83	0.85		
SSA	0.7	0.68	0.66	0.64	0.61	0.61	0.67	0.67	...	...		
Eth	0.23	0.28	0.27	0.36	0.34	0.34	0.32	0.32	0.35	0.31		
SSA	...	...	...	...	...	...	...	...	...	...		
Eth	8555	11627	17969	18375	28691	41364	29581	26820	32516	49244		
	Graduates in science. Tertiary. Total											
SSA	...	...	...	...	...	...	...	...	...	...		
Eth	469	524	...	680	1361	2870	2130	2399	2440	4205		
	Graduates in engineering, manufacturing and construction. Tertiary. Total											
SSA	...	...	...	...	...	...	...	...	...	...		
Eth	661	704	...	1259	2197	2511	2396	2235	2813	3128		

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Otsikko: Education's Contribution to the Economic Growth of Sub-Saharan Africa

Aihe:

Tekijä: hanane ahmed

Avainsanat:

Kommentit:

Luontipäivä: 8.7.2010 16:26:00

Version numero: 2

Viimeksi tallennettu: 8.7.2010 16:26:00

Viimeksi tallentanut: Owner

Kokonaismuokkausaika: 32 minuuttia

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Viimeisestä täydestä tulostuksesta

   Sivuja: 26

   Sanoja: 5 384 (noin)

   Merkkejä: 43 613 (noin)