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THE ECONOMIC BENEFITS OF EDUCATION AS A RETURN TO GDP PER CAPITA

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Abstract:

This paper examines many different factors of education, including the levels of education received, the expenditures per student as well as for each level of education, and the measurement of unemployed with said levels of education as to how it affects the levels of GDP per capita. What is consistent across each regression is that in fact, the average years of education received by the population will most closely have a beneficial effect on the levels of GDP per capita. What these regressions also show are tendencies to look more towards the future rather than the past. When considering unemployment, it didn't matter much of how much was being spent on education but rather simply, what the literacy rates were for the population.

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1.0 Introduction

It has been heavily debated by many economists that education will only raise the levels of output per worker in the short run, but in the long run, will have little to no effect on the growth levels of that economy. This paper will examine random variables related to education, the amount of GDP invested in education, the labor force with certain levels of education attained and the amount of unemployed with certain levels of education attained. From this will be derived a regression analysis on how these variables affect the level of GDP per capita currently recorded from the year 2008. A total of 30 countries have been chosen at random including both developed and developing countries in order to figure out how these different economies respond to education levels through its GDP per capita. Using the World Development Indicators database, nine random variables were chosen as well as the average years of education for each country most current in 2008 in order to derive a regression equation that will indicate which variables have the greatest effect on GDP per capita, as well as which variables have a negative effect on GDP per capita. This paper specifically looks at data from the Twenty-First century as a means to better the immediate future of the economies of the selected countries. Data has been collected from the years of 1999 to 2005 to be analyzed as a time series affecting the current GDP per capita recorded from 2008.

One of the strongest educational systems in the world can be found in the United States where they lead the world in average years of education with twelve years. What this means is the average adult over the age of fifteen has completed both primary and secondary levels of education, earning their high school diploma. The use of colleges and universities is also crucial in developing strong skills that can be later used in the labor force, making each student have a concentration in a specific subject or even two subjects when entering the job market. In the case

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for the United States, advancements in education are crucial in order to obtain a skilled job however there are variances among other countries that value education not quite as much. Sometimes the most effective way for a student to have a positive impact on the level of GDP per capita is to complete a basic level of education and then enter the labor force immediately. The average years of education will help to determine among these countries whom value education the highest and whom value immediate entry into the job market. As cases before have shown, key determinants of economic growth in the long run do not rely on education as it is only a short term means to increase the levels of income for that country. A key working paper that will be referenced throughout this paper is titled, "Literacy and Growth," written by Serge Colombe and Jean-Francois Tremblay.

The rest of the paper is organized as follows: Section 2 gives trends in both education and growth over the years. Section 3 gives a brief literature review. Data and estimation methodology are discussed in section 4. Finally, section 5 presents and discusses the empirical results. This is followed by a conclusion in section 6.

2.0 Trends in Education and Growth

Education has been becoming more of a concern as every new day passes. As a child growing up in the United States, education is greatly stressed as the key to the future and the path that will help to develop careers later in life. In fact, education has become such an important tool of the individual that it is no longer acceptable in highly developed countries like the United States to merely obtain a high school diploma. With technology advancing to more and more intricacies, it is becoming almost a requirement for students to go on to a tertiary level of education to become masters of a certain area of study. However, this is not consistent across

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every country of the world, but it is becoming more and more evident that overall, education is

being treated more seriously and a tool that could lead to lessening the gap between developed

and developing countries.

Figure 1: Growth of per Capita GDP
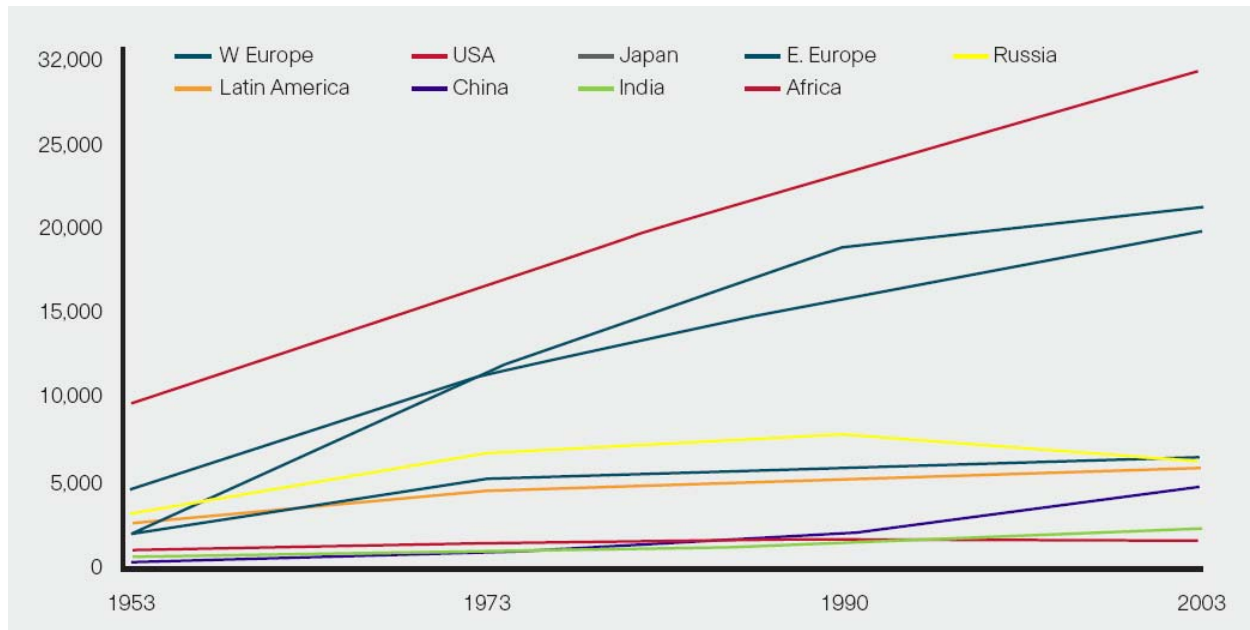
Source: Education and Economic Growth (2007)

Figure 1 represents the growth of per capita GDP for nine major regions of the world over a fifty

year period. With the exceptions of Russia and Africa, every region of the world has shown a

long term growth in its GDP per capita.

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Figure 2: Net Enrollment in Primary Education
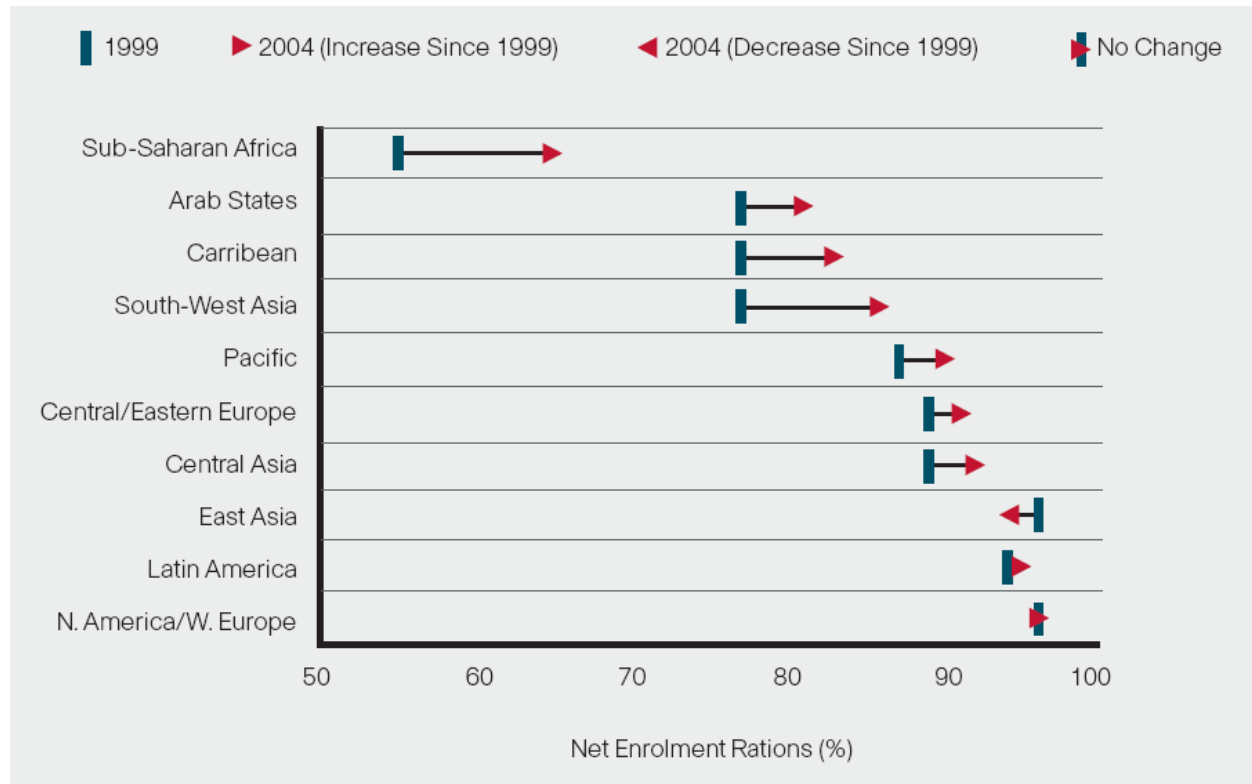
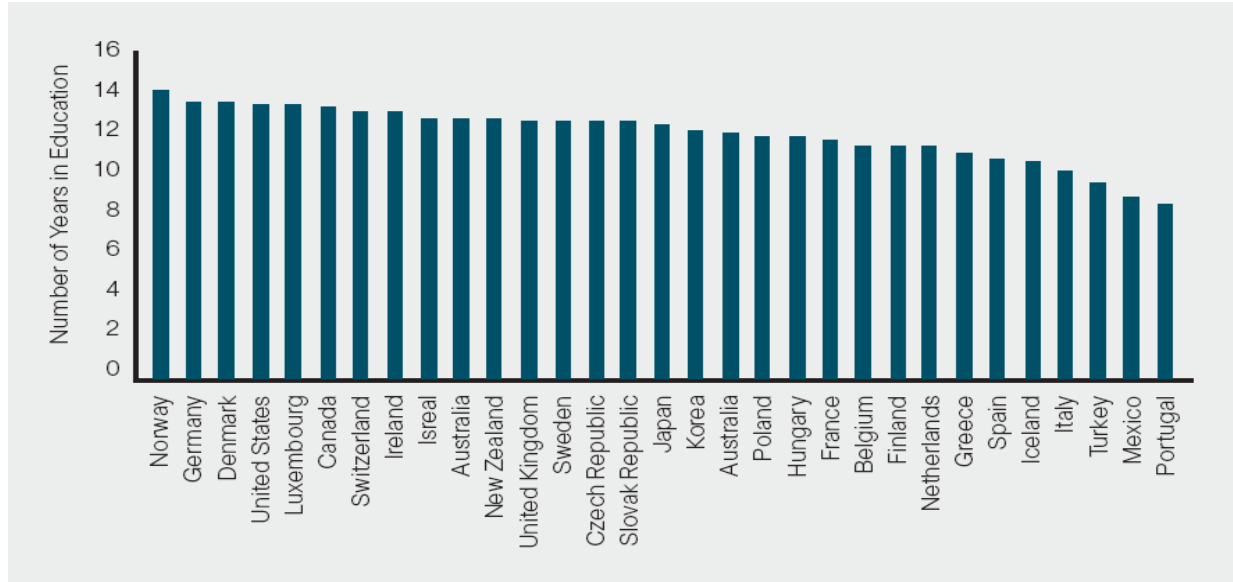

Source: Education and Economic Growth (2007)

Education in general is being understood as an important role in developing human capital and as shown above, the net enrollment in almost every region in primary education has seen an increase in numbers. There has been either little or no change in the US and Western Europe as they have been atop the highest percentage of enrolment for many years but an encouraging image is the other regions of the world that are increasing their percentages of enrolment. It is becoming ever more important with more and more technological advancements that these other regions of the world become better educated simply in order to understand what these new technologies accomplish as well as bringing some form of contribution to these advancements in technology within their own regions.

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Table A: Children Out of School

	1999	2000	2001	2002	2003	2004
Not in Primary School	110,244	107,852	105,307	107,395	101,038	91,032
Not in School	98,172	94,787	92,379	93,824	86,828	76,841

Source: Education and Economic Growth (2007)

Table A above represents the entire world of children who are not a part of the educational system for each year between 1999 and 2004. It has been reported that data from 2007 has shown that there are around 77 million children that are not enrolled in schools, varying little from the number shown for 2004. It also gives the numbers of children who are not in some form of primary school either. Although these numbers are high, the trend since the turn of the new millennium gives hope for the futures of the worlds' economy. There has been a steady decline in the numbers reported showing that education is being identified as an important indicator for economic development across the entire world.

Figure 3: Educational Attainment of Adult Population

Source: Education and Economic Growth (2007)

Figure 3 depicts the educational attainment of the adult population. It is taken from the year 2004 and includes all of the adult population with the average number of years those adults had spent in the educational system. Apart from what this paper has used as average number of years currently found for the countries used, we can see that the levels of education are actually a little bit higher than what was found. What this can tell a researcher is that it is including every level of education, for example the extra years spent in a college or university, or that for those other countries, either pre-school education is included in the statistics or that those countries have longer minimal requirements for children in the educational systems, reflected in the numbers for the entire adult population. The data that was found and used in this paper however has the United States ranked as the leader in average years spent receiving an education, which is 12; expressing that on average the entire population has received at least a high school diploma.

Figure 4: Private internal rates of return for university level

achievement

Source: Education and Economic Growth (2007)

Figure 4 represents the return that the populations of countries have from the advancement of their education into tertiary levels of education, or the advancement into a college or university. It is also broken down to specifically show the return that both males and females of the selected countries experience as a result of this investment.

3.0 Literature Review

In the paper by Coulombe and Tremblay (2006), they use a time series from 1960-1995 measuring the literacy levels of the labor markets. It uses 14 OECD countries and considers literacy levels as an investment in education. The measure of human capital based on literacy scores tells us more for the relative growth of countries rather than using years of schooling.

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Overall, literacy scores have significant, positive effects on growth paths and long run levels of GDP per capita and labor productivity. One more year of schooling increase aggregate labor productivity by about 7%. Investment in human capital for women is actually more important than that for men. In turn, increasing the average tests scores becomes a more accurate measure of human capital than schooling data would because it is more comparable across countries. However at the same time it could be distorted by migration and the depreciation of human capital over time. One should be cautious about an open economy as convergence of human capital is the driving force behind the convergence of GDP per capita during the economy's transition to the steady state. Imbalances of human and physical capital could also result. In the future, other analysis could include comparisons of the performance of human capital based on literacy tests with those based on schooling data for growth in sub-national economies.

Islam, Wadud and Islam (2007) use a multivariate causality analysis on the relationship between education and growth, specifically for Bangladesh. This paper also includes both capital and labor as variables which also shows bidirectional causality between education and growth. This bidirectional causality can be defined in three categories including income driving education to grow, education causing income to grow or both education and income causing each other to grow simultaneously. It was originally thought that it would be one or the other and never determined that it could be possible to occur simultaneously in fact. In order to determine the trend, one should use an income equation and an education equation that are both statistically significant at the 1% level. As a result of the paper's finding, if the analysis is confined to 1984-2003, then there is actually no evidence of a long term relationship between education and growth specifically for Bangladesh.

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Stevens and Weale (2003) provide data from the early 20th century that is more representative of thoughts today about the relationship between education and economic growth. It analyzes the role of education in facilitating the use of best-practice technology. Overall, the living standards have risen greatly since the 1800's and can be linked to the advancement of education. Education is needed for people to benefit from scientific advancements as well as being able to provide contribution to that advancement. Levels of income do in fact depend on the levels of education and education should be looked at as an investment decision into human capital. In the end, there is no conclusive evidence that returns to education will vary more than 6%-12% based on previous studies. There is evidence however that education is needed as a means to make good use of available technology respecting that returns to education diminish with levels of development.

Miller (2007) says that overall, schooling is necessary for industrial development. Schooling from the 19th century generates cognitive, behavioral and social knowledge which in turn causes organization. Schooling is necessary but it is not the driving factor behind industrial development however individuals and societies clearly gain from investments made into schooling. The specific form of education system is an indispensable component of an industrial growth society. Making investments in all elements of the schooling system and making people attend those schools is necessary but not a sufficient condition for expanding the GDP. The participation in education has steadily increased in 2007, however there are still 1 in 5 adults in the world's population that do not have minimum literacy skills as well as 77 million children who are not enrolled in the schooling system. It has been proven that each additional year of schooling will raise the income of that individual about 10% here in the United States. In an OECD area, the long term effects of one more year of schooling on the output is between 3% and

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6%. Future predictions make it possible for the relationship between what people know and the wealth of a society to become stronger and clearer in the near future.

4.0 DATA and Empirical Methodology

4.1 Definition of Variables

The basic model used in this model uses GDP per capita as the dependant variable and bases findings from the literature review to determine other possible influential variables that will have a direct return on that GDP per capita. The model chosen is as follows:

$$\text{GDP (PPP)} = \beta_1 + \beta_2(\text{AVGED}) + \beta_3(\text{LIT}) + \beta_4(\text{LFPRI}) + \beta_5(\text{LFSEC}) + \beta_6(\text{LFTER}) +$$
$$\beta_7(\text{PUB}) + \beta_8(\text{UNPRI}) + \beta_9(\text{UNSEC}) + \beta_{10}(\text{UNTER}) + \beta_{11}(\text{EXPPRI}) + \beta_{12}(\text{EXPSEC})$$
$$+ \beta_{13}(\text{EXPTER}) + \varepsilon$$

GDP (PPP) is the GDP per capita for the year 2008 and all variables are part of a time series of data collected from the year 1999-2005 from 30 various countries around the world.

Independent variables consist of twelve variables obtained from various sources. Appendix A provides the data source, acronyms and descriptions of selected variables. First, AVGED represents average years of education received for selected countries. Second, LIT represents literacy rate as a percent of total population. Third, LFPRI represents % of the total labor force with a primary education. Fourth, LFSEC represents % of the total labor force with a secondary education. Fifth, LFTER represents % of the total labor force with a tertiary education. Sixth, PUB represents public spending on education as a total (% of GDP). Seventh, UNPRI represents the unemployed with primary education (% of total unemployment). Eighth, UNSEC

represents the unemployed with secondary education (% of total unemployment). Ninth, UNTER

represents the unemployed with tertiary education (% of total unemployment). Tenth, EXPPRI

represents the expenditure per student for primary education (% of GDP per capita). Eleventh,

EXPSEC represents the expenditure per student for secondary education (% of GDP per capita).

Lastly, EXPTER represents the expenditure per student for tertiary education (% of GDP per

capita).

4.2 Data

This study uses results collected yearly from the period of 1999 to 2005 for thirty different

countries around the world. Data was primarily obtained from the WDI Online database as well

as a few other worldwide data sources. Summary statistics for the data are provided in Table 1.

Table 1: Summary Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
GDP (PPP)	30	28653.33	12940.60	4400.00	55600.00
AVGED	30	8.73	1.96	4.90	12.00
LIT	30	96.44	4.63	82.40	99.70
LFPRI	30	29.83	16.23	3.43	69.17
LFSEC	30	41.26	15.44	12.50	73.43
LFTER	30	24.60	10.16	7.00	49.00
PUB	30	5.38	1.15	3.83	8.00

UNPRI	30	40.27	15.52	1.17	72.00
UNSEC	30	40.97	12.52	14.43	65.29
UNTER	30	15.99	9.56	2.80	44.57
EXPPRI	30	18.19	4.71	11.00	27.60
EXPSEC	30	22.68	6.18	10.20	36.00
EXPTER	30	35.57	12.49	14.50	67.00

5.0 Empirical Results

The primary objective of this particular study was to find out which specific variables related to education will have a positive return to the levels of GDP per capita. Initial tests showed many variables to be skewed or highly correlated and therefore many regressions had to be performed. In general, it would be expected to find that both the literacy rate and the average years of education would yield a positive return to GDP per capita. Those who are unemployed would be expected to hurt GDP per capita and have a negative coefficient and expenditures the government makes on education would also be a negative factor of GDP per capita. We would also expect to find that those in the labor force would have a positive return and the higher the level of education, the more positive the coefficient will be.

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Table 2: Regression using Education

	Coefficient	Std. Error	t-Statistic	Prob.
AVG_EDU	2962.459	1166.44	2.539744	0.0187
EXPSEC	1556.34	277.3267	5.611936	0.0000
EXPTER	293.1553	140.0034	2.093916	0.048
LFTER	995.1515	340.9446	2.918807	0.008
PUB	-5670.973	1874.559	-3.025231	0.0062
UNSEC	-175.7432	133.6736	-1.314719	0.2021
UNTER	-631.0387	276.4473	-2.282673	0.0325
C	-19605.61	7032.182	-2.787983	0.0107
R-Squared	0.809161			
Adj R-Sq	0.748439			

This regression proved to be the most statistically significant out of any test that was run and also reflected the highest R^2 value of 0.809161. In this test however, there was one statistically insignificant variable, UNSEC or unemployed with a secondary education. Every other variable was statistically significant at the 95% confidence interval.

Table 3: Regression using Literacy

	Coefficient	Std. Error	t-Statistic	Prob.
LIT	1784.662	650.316	2.744301	0.0118
EXPPRI	-268.95	510.7842	-0.526543	0.6038
EXPSEC	499.861	459.5825	1.087642	0.2885
EXPTER	302.0047	167.5816	1.802136	0.0852
LFPRI	117.0582	163.4525	0.716161	0.4814
LFSEC	11.80037	164.8751	0.071572	0.9436
LFTER	480.4644	192.1392	2.500606	0.0203
C	-176446.4	61250.62	-2.880728	0.0087
R-Squared	0.760721			
Adj R-Sq	0.684586			

In Table 3, instead of using the average years of education, the literacy rate was used. Also, every variable related to expenditure on grade level and the labor force level was used.

Public expenditure on education was also omitted. What was found to be odd was that the EXPPRI had a negative coefficient whereas EXPSEC and EXPTER both had positive coefficients but only the EXPTER was determined to be statistically significant. This would appear to be odd because one would think that the more expenditure per student, the less the GDP per capita would be for a country.

Another regression that was run used average education, as well as the public expenditure per student. Instead, this regression looked at the relationship that unemployment plays and at what levels of education those people are at. However, the regression proved to be statistically insignificant.

In order to fully test the insignificance, instead of using the average years of education, the literacy rate was used. Results are as follows:

Table 4: Unemployment, Literacy and Public Expenditure

	Coefficient	Std. Error	t-Statistic	Prob.
LIT	2043.064	412.1833	4.956688	0.0000
PUB	2550.001	1507.396	1.69166	0.1037
UNPRI	219.8154	156.4291	1.405208	0.1728
UNSEC	98.74788	184.0801	0.53644	0.5966
UNTER	336.964	189.4369	1.778766	0.0879
C	-200394.3	42710.79	-4.69189	0.0001
R-Squared	0.686657			
Adj R-Sq	0.621377			

In Table 4, it is proven that the literacy rate is statistically significant when also considering the unemployed levels of education and the public expenditure on education. It was also very odd to find that all three groups of the unemployed would result in a positive coefficient when it was assumed that the more people who are unemployed, the less is being

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contributed to the GDP per capita. In this regression, there could be a possibility for skewed data as the public expenditures variable and the set of unemployment variables all have positive effects of the GDP per capita. One would assume that these would lower the levels of GDP per capita which lead to the belief that in some way there are highly correlated variables. Also, use of the literacy variable might also lead to varying results as average years of education were used for the first regressions.

After observing the results of several regressions, there has been evidence that the overall most important variables are those that involve the tertiary level of education. These variables turned out to continually have the greatest effect, whether negative of positive, on the levels of GDP per capita. What one can assume from these findings are that as the world continues to advance, it will and has been more important to obtain not only some level of education, but some level of tertiary education in order to more effectively contribute to the levels of GDP per capita. This goes along with the fact that more education is needed in order to aid in the advancement of technology which in turn aids the advancement of long term positive economic growth.

Out of some possible policy implications, the strongest would most likely be to invest more into the tertiary levels of education and to try and limit the amount of unemployed who have achieved the tertiary levels of education. Both the primary and secondary levels of education had showed positive returns however they were not as impactful as that for tertiary levels. It may also mean that overall, the current levels of both expenditures and unemployed are at sufficient levels that are not drastically affecting the levels of GDP per capita either negatively or positively.

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Other possible policy implications are that countries begin to invest more into the quality of education and continue to raise the importance of obtaining an education. The country itself must understand how important schooling is and allow for the development of those students to create a stronger, more productive economic entity. Although not always the most positive, it has been proven that primary and secondary levels of education are important for GDP per capita, but it seems as if what countries are doing right now is on the correct path towards economic growth.

6.0 Conclusion

This paper examines many different factors of education, including the levels of education received, the expenditures per student as well as for each level of education, and the measurement of unemployed with said levels of education as to how it affects the levels of GDP per capita. What is consistent across each regression is that in fact, the average years of education received by the population will most closely have a beneficial effect on the levels of GDP per capita.

What these regressions also show are tendencies to look more towards the future rather than the past. When considering unemployment, it didn't matter much of how much was being spent on education but rather simply, what the literacy rates were for the population. As holds true with the working papers discussed in the literature review, education must be looked at as an investment into the future and as time moves on, it is becoming more and more critical to obtain some level of tertiary education rather than just obtaining a basic level or even the completion of high school. Trends have proven that there is more awareness of the importance of education for

long term development primarily because as the developed countries become more technologically advanced, in order for the developing countries to try and keep up they must teach their youths how to use that technology to their own economic benefit.

What can be done to improve upon future analysis is to analyze more in depth the variable of education and how exactly it contributed to society. How it is felt as a return into both human and physical capital can both greatly affect how the levels of education can affect the levels of GDP per capita. Also, there could be problems affecting the results by using the average years of education for some of the regressions and using the literacy rate for the others. There could be elasticity issues in how incremental changes are experienced for each variable. This could help to create more significant influences from the variables on the levels of GDP per capita. Other studies should also look into how education is considered an investment in human capital for the future and how it helps to stimulate innovation. If it is true that tertiary levels of education have been the most significant, then how much is this advanced level of education an important factor as we live our lives during the new technology age. In any case, it is important to realize what will help to positively affect the state of the economy both in the long run and in the short run as well.

Appendix A:
Variable Description and Data Source

Economic Variable	Description	Source

GDP (PPP)	GDP per capita (2008)	The 2008 World Factbook
AVGED	Average years of education received	Nation Master Online
LIT	Literacy rate as a percent	United Nations Development Report
LFPRI	% of total labor force with primary education	WDI ONLINE
LFSEC	% of total labor force with secondary education	WDI ONLINE
LFTER	% of total labor force with tertiary education	WDI ONLINE
PUB	Public spending on education, total (% of GDP)	WDI ONLINE
UNPRI	Unemployed with primary education (% of total unemployment)	WDI ONLINE
UNSEC	Unemployed with secondary education (% of total unemployment)	WDI ONLINE
UNTER	Unemployed with tertiary education (% of total unemployment)	WDI ONLINE
EXPPRI	Expenditure per student for primary education (% of GDP per capita)	WDI ONLINE
EXPSEC	Expenditure per student for secondary education (% of GDP per capita)	WDI ONLINE
EXPTER	Expenditure per student for tertiary education (% of GDP per capita)	WDI ONLINE

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