

The Impacts of Educational Expenditure and the Service Sector on Economic Growth

Bryan Ascher

Honors Thesis

Rutgers University

School of Business – Camden

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Professor Chon Goh, Thesis Advisor

Professor Alok Baveja, Second Reader

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Abstract

The effects of various factors, such as the quality and the quantity of education, on economic growth have been topics of interest concerning long term economic development for decades. Determining the appropriate level of education or allocating the appropriate educational resources effectively would have enormous policy implications for all countries regardless economic status. The purpose of this study is to try to further understand the overall impact of the public expenditure of tertiary education (per student), as well as other factors such as the service sector, on the gross domestic product (GDP) growths of various countries throughout the world. In this research, we looked at the relationship between the percentage of GDP per capita spent on tertiary education per student, the percentage of total workforce employed in services and the GDP growth of various countries throughout the world. Data from 31 countries from 1999 to 2007 with various levels of GDP were collected and analyzed. We found that tertiary expenditure per student, measured in terms of percentage of GDP per capita, as well as the percentage of workforce employed in the service sector, are negatively related to the GDP growth. This research may contain policy implications for countries that are lagging behind other more developed countries in terms of economic growth and also allow economies to remain competitive in the future.

Introduction

The purpose of this study is to investigate the possible relationships of various factors, such as the allocation of educational resources and different workforce educational backgrounds, on the growth in the gross domestic product (GDP) of different countries throughout the world. GDP growth is important for a number of reasons: (a) it reduces poverty levels by increasing average income levels and increases quality of life by allowing consumers to enjoy more goods and services, (b) it could possibly lower unemployment levels as firms with higher output levels are able to employ more workers, (c) it helps in reducing government borrowing by creating higher tax revenues which can further lead to better public services such as health and education, and (d) it helps the country to be more economically and politically stable. Mainly driven by improvements made to economic efficiency, often referred to as productivity, economic growth can also help improve the standard of living. Recently, China is a clear example that benefits

tremendously from increasing GDP, with an average annual growth rate of 10.3% from 2000 to 2010 (Worldbank.org).

The possible factors that may impact GDP growth could be the following: labor force distribution, employment rates and wages, tax rates, allocation of educational resources, literacy rates, levels of schooling, graduation success rates and political structure. Although the main focus of this study is study the impact of education and the service sector on GDP growth, other factors that may possibly affect GDP growth will also be analyzed. The general consensus is that college education can improve national competitiveness and GDP growth, but still, many unknown variables exist in areas such as educational attainment levels (years), subject area concentration, investment in and allocation of educational resources that may also have an impact on GDP growth.

In President Obama's January 2011 State of the Union address, he proposed a five-year freeze in discretionary spending on non-defense programs but said he would spare education and research calling them "vital to the nation's long-term growth and competitiveness." He also restated his goal of being the world's leading nation in college-completion rates by 2020. Clearly, education plays a vital role in any society by providing a foundation that brings economic wealth, social prosperity and political stability. However, many factors contribute to a country's wealth as measured in terms of its gross domestic product per capita.

According to an international education test administered by the Organization for Economic Cooperation and Development (OECD) in 2009 for high school students, Shanghai, China greatly outranked the United States in the subject areas of science, reading and math, often with huge gaps in scores (Dillon 2010). But, is this the reason for China's relatively high growth rate? A more educated overall population leads to a better educated work force. However, it is

not clear whether a stronger emphasis on basic education or tertiary is more effective in raising GDP. Moreover, other factors may also be significant in raising GDP.

The percentage of the GDP which is comprised of the service sector could also possibly impact GDP growth. Unlike manufacturing, service industries generally tend to be more diverse and less capital intensive which may negatively affect GDP growth. Countries with high GDP generally have higher percentages of the GDP in the service sector. This is because when the population's income is high, the people have higher disposal income which allows them to spend more on services such as entertainment, healthcare, and travel.

The service sector consists of more than 65% of the GDP for most of western Europe, USA, Canada and other countries in Asia Pacific such as Japan, Hong Kong and New Zealand. Although not as large as that of USA's, the service sector is growing fast in countries such as Thailand, India, China, Thailand, and Malaysia. For example, in Thailand (World Bank, 2012), the services sector accounts for nearly half of aggregate production and 40 % of national employment. This sector is a growing component of the Thai economy. Between 2000 and 2005, the services sector created 2.6 million jobs compared to just 1.6 million in the industrial sector. However, labor productivity of the services sector fell sharply during the 1997-98 financial crises and has remained stagnant ever since. This lackluster productivity improvement of the services industry raises concerns about the potential of the sector to be an engine for future gains in real wages and living standards of Thai workers.

The results of this research could potentially help the United States and other countries better allocate their precious financial resources more effectively to increase their GDP and to remain globally competitive for years to come. Furthermore, these implications could result in policy recommendations that could not only improve the economic wealth of a country but also

the education systems that are currently in place, thus improving quality of labor forces for future generations. More specifically, these findings could shed new light on the effectiveness of basic (primary and secondary) and tertiary education and offer insights that help countries position their education systems for a more productive economy.

Literature Review

Expenditure on education is a good indicator of the importance that a country places on education compared to its overall allocation of resources. Interestingly, as a whole, OECD countries spend about 6.2% of their collective GDP on educational institutions, while tertiary education alone makes up almost one-third of this percentage. Some of the countries that invested the highest percentages of their GDP on education include Denmark, Iceland, and the United States, while Italy and the Slovak Republic spent the least. As more people are completing upper secondary and tertiary education than ever before, additional private and public investments in education are simultaneously being made. Between the years 1995 to 2007, investments have increased on average by 49% in OECD countries. Furthermore, of the available data from 27 OECD countries, 10 countries increased all levels of educational expenditure combined at a faster rate than GDP, while the remaining 17 countries lagged behind (OECD 2010).

There could potentially be several factors, as previously mentioned, that could contribute to economic growth. Compilations of international data, such as those found in The World Bank, have greatly facilitated the ability to compare such data for analysis. Chatterji (1998), through the use of a simple regression testing for the relationship between various independent variables (such as school enrollment rates at both the secondary and tertiary levels) and

economic growth, found evidence in support of the importance of tertiary education over secondary education as a driver of growth. However, the increase in tertiary education spending cannot continue forever and its effect on enhancing economic growth may only be experienced by countries that lag behind countries that are already near maximum tertiary enrollment rates.

As indicated by Sianesi (2003), “evidence from labour economics consistently points to substantial monetary returns accruing to individuals investing in education”. The benefits of education may not be restricted to these individuals, due to the “spill-over” effect. Therefore, it is important to look at the macro level to validate the public support for education. Empirical evidence suggests that increasing average education by one-year increases the level of output per capita by between three and six percent. However, it is difficult to say which countries would experience higher levels of output per capita, and therefore, further research would be needed.

Another important study in the area of education and its impact on economic growth comes from Robert Barro (2002) who looked at the number of years of school attainment at various levels to measure the quantity of education and test scores to analyze the quality of education. Based on his empirical evidence, an additional year of schooling raises the growth rate by 0.44 % per year. What is more interesting is that science scores were found to have a significant positive effect on economic growth and offer a slightly higher predictive power over that of math scores. Furthermore, results suggest that although both quality and quantity of schooling play a role in economic growth, quality is much more important. Determining the priority at which investments in each level of education should be made, as well as the appropriate proportion, is the central issue for governments when deciding how to effectively allocate educational resources. Countries that are spending more on higher education today tend to also experience more unequal income distribution in the future (Gioacchino 2009).

Furthermore, there is a difference between public and private education. States with a large market share of students in private higher education institutions have a negative relationship between higher education spending and economic growth (Curs 2011). Therefore, differentiating between private and public educational may be a key element in understanding their role in productivity growth.

Although the relationship of the service sector and productivity has been studied for a long time, the impact of the service sector on the productivity of nations is still not well understood. Baumol (1967) first indicated that the growth of services, which tend to have lower productivity growth than that of the manufacturing sector, slowed down the productivity growth of countries with high service sector. His well-known theory of 'cost disease' describes the rise of salaries in service jobs that have experienced no increase in labor productivity. This goes against the theory in classical economics that wages are always closely tied to labor productivity changes. However, Bosworth and Triplett (2000) indicated that substantial disparities exist among productivity growth rates within the manufacturing sector as well as the service sector. They estimated that service industries accounted for 73% of post-1995 labor productivity growth in US, which appear to contradict Baumol's 'cost disease'. In fact, Griliches (1994) also pointed out that some of the services industries have growth rates as high or even higher than that in manufacturing from the years 1947-1973. Oulton (1999) also showed that relatively high productivity growth has been observed in certain service industries such as financial intermediation and renting of machinery and equipment. However, it does appear that productivity growth is slow for services where the outputs are difficult to measure; such as health services.

Baumol (2002) later revised his findings and stated that it is necessary to distinguish between different types of services and stressed the role of innovation and technology in the evolution of services. Baily, Farrell and Remes (2006) indicated that five of the largest contributors to productivity growth in US after 2000 were service industries. Over the past decade, the service sector has been a major source of productivity growth and employment in the US. However, the productivity growth of service industries appears to be different for different countries. For example, Mizuno (2005) clearly showed that the labor productivity growth of services still lags behind that of manufacturing sector in Japan for years 1999-2002. Maroto-Sanchez and Cuadrado-Roura (2009), using data from a sample of 37 OECD countries from 1980-2005, hypothesized that structural changes, particularly growth in services, plays a role in productivity growth and the scope of advances in productivity differs significantly across service industries.

Clearly, the impact of services on productivity growth is not fully understood. Some of the reasons can possibly be explained from the operations management perspective. That is, services, when compared to manufactured goods, have unique characteristics such as perishability, higher variability and intangibility. These characteristics make measurement of service productivity problematic. For example, it is more difficult to control for quality in measuring quantity of production in services, as opposed to manufactured goods.

Research Methodology

After researching the literature, we found that the majority of the published work in the field so far focused on data between the years 1960 to 1985. One of the contributions that we

offer in this study is use of the latest data available. To begin our investigation, we researched the economic literature to uncover what has been done in our areas of interest. In order to better understand the possible impact of education on productivity growth, we first started collecting the latest available macro-economic data (GDP per capita, percentage of GDP spent on total education per student, the percentage of GDP per capita spent on tertiary education per student, percentage of GDP spent on research and development, the percentage of total employment in the service sector, and productivity growth), of nearly 196 countries from 1999-2007. However, inconsistent and/or missing data forced us to reduce the country data set. We used the criterion of eliminating the countries which had more than two data entries missing for any of the previously mentioned variables. For example, if a country was missing data on the percentage of GDP spent on total education for years 1999, 2000 *and* 2001, the country was eliminated from the dataset. Ultimately, we ended up with a list of 31 countries (see Appendix 1). These countries range from Argentina to the United States and were selected within the range of years between 1999 and 2007. The years were selected to help analyze some of the most recent data available so as to offer an up-to-date analysis. Although the original goal was to analyze a larger number of variables to compare to economic growth, the lack of consistent data available would have yielded results that were weak at best.

Appendix 1: Countries from which the economic data is collected from 1999-2007

Argentina	France	Netherlands
Austria	Hungary	Norway
Azerbaijan	Iceland	Poland
Brazil	Ireland	Portugal
Colombia	Israel	Slovak Republic
Croatia	Italy	Spain
Cuba	Japan	Ukraine
Cyprus	Korea, Rep.	United Kingdom
Czech Republic	Kyrgyz Republic	United States
Denmark	Latvia	
Finland	Mexico	

The next step in our research was to conduct a multiple linear regression using economic growth (GDPG) as our dependent variable and all other factors as independent variables; such as: GDP per capita (GDP), percentage of GDP per capita spent on total education (PEDU), public expenditure on tertiary education per student measured in terms of percentage of GDP per capita (PGDPTE), percentage of GDP per capita spent on Research and Development (RnDP), and percentage of national employment in the services sector (SERVP). (See Table 1) From there, we were able to analyze the impact of each independent variable on economic growth to determine if any of the previously listed factors offer any explanatory power in determining economic growth.

Table 1: Multiple Linear Regression of All Factors on GDP Growth

<i>Regression Statistics</i>	
Multiple R	0.387062457
R Square	0.149817345
Adjusted R Square	0.133015317
Standard Error	3.715471651
Observations	259

<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	5	615.4578031	123.0915606	8.916622366	8.15079E-08
Residual	253	3492.596586	13.80472959		
Total	258	4108.054389			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	12.98288376	1.928149753	6.733337876	1.10708E-10
GDP	-1.79409E-07	2.07218E-05	-0.008657977	0.993098843
PEDU	0.162694201	0.229818469	0.70792483	0.479643597
PGDPTE	-0.062043986	0.021713071	-2.857448688	0.004625838
RnDP	-0.276487757	0.274399108	-1.007611719	0.314603601
SERVP	-0.11701209	0.034664405	-3.375568957	0.000852451

Looking at the results, a few noteworthy observations were made. First, the coefficient of determination, also called the R-squared value, is a useful statistical tool that can help describe the degree to which a variable is linearly relations can be explained. The R-squared value in our results, 0.133, suggest that all five variables combined offer 13.3 % explanatory power in determining economic growth. Although this number may seem low, when all other factors that could possibly contribute to GDP growth are considered, this percentage is actually insightful. A possible interpretation of this percentage could be that about 13.3% of economic growth can be explained by changes in the five earlier mentioned variables combined: GDP per capita (GDP), percentage of GDP spent on total education (PEDU), the percentage of GDP per capita spent on tertiary education (PGDPTE), percentage of GDP spent on research and development (RnDP), and the percentage of workforce in the service sector (SERVP).

Based on this regression analysis, only the percentage of GDP spent on total education (PEDU) showed a positive relationship with GDP growth while the other four factors, namely GDP per capita (GDP), the percentage of GDP per capita spent on tertiary education (PGDPTE), percentage of GDP spent on research and development (RnDP), the percentage of workforce in the service sector (SERVP), indicated negative relationship to GDP growth. Upon further investigation, we also observed the p-values of our variables. The p-value helps provide a measure of the strength of the results of a test, and the smaller the p-value, the more evidence exists against the null hypothesis. As it turns out, only two of the five variables, namely the percentage of the workforce employed in the service sector (SERVP) and the percentage of the GDP per capita spent on tertiary education (PGDPTE), showed statistical significance, with p-values well below the 5% significance level that is traditionally used in statistical analysis. All

other factors - GDP, PEDU and RnDP - were found to be statistically insignificant, with p-values greater than 5%.

The next step that was taken involved removing the statistically insignificant variables from the data to isolate the statistically significant variables for further analysis. (See Table 2)

Table 2: Multiple Linear Regression of PGDPTE and SERP on GDP Growth

<i>Regression Statistics</i>					
Multiple R	0.380246419				
R Square	0.144587339				
Adjusted R Square	0.137904428				
Standard Error	3.704980673				
Observations	259				

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	2	593.9726525	296.9863262	21.63538165	2.08203E-09
Residual	256	3514.081737	13.72688178		
Total	258	4108.054389			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>
Intercept	13.8383541	1.576593773	8.777374573	2.42464E-16	10.73360924
PGDPTE	-0.05171149	0.016321866	-3.16823391	0.001719905	-0.083853713
SERVP	-0.12831771	0.024511462	-5.23500825	3.44082E-07	-0.176587488

Looking at the adjusted R-squared value of our data, we observe a new value, at 13.79%, is not much different from the original value that included all five variables. This number suggests that the combination of the percentage of GDP per capita spent on tertiary education per student along with percentage of the workforce employed in the service sector could possibly explain the percentage of productivity growth measured in terms of GDP per capita. That is,

PGDPTE and SERP together might offer a collective 13.79% explanatory power in determining economic growth (PGDP).

From there, we separated our two statistically significant variables (PGDPTE and SERP) in order to individually analyze their relationship with respect to economic growth (see Table 3). Looking at the relationship between PGDPTE and economic growth first, we see that the R-squared value is reduced to 4.93%. This number suggests that the percentage of GDP per capita spent on tertiary education per student, alone, might be responsible for almost 5% of the growth in a country's respective economy. Also, looking at the coefficient of the regression, a negative number suggests a negative relationship. That is, the higher the percentage of GDP per capita spent on tertiary education (per student), the lower the resulting economic growth (see Graph 1). More specifically, for each additional 10 percentage point increase in expenditure on tertiary education per student as a percentage of GDP, economic growth decreases by 0.643 percentage points.

In United States, private higher education generally costs more than public education. The above-stated finding appears to support Curs research that showed states with a large market share of students in private higher education institutions have a negative relationship between higher education spending and economic growth (Curs 2011).

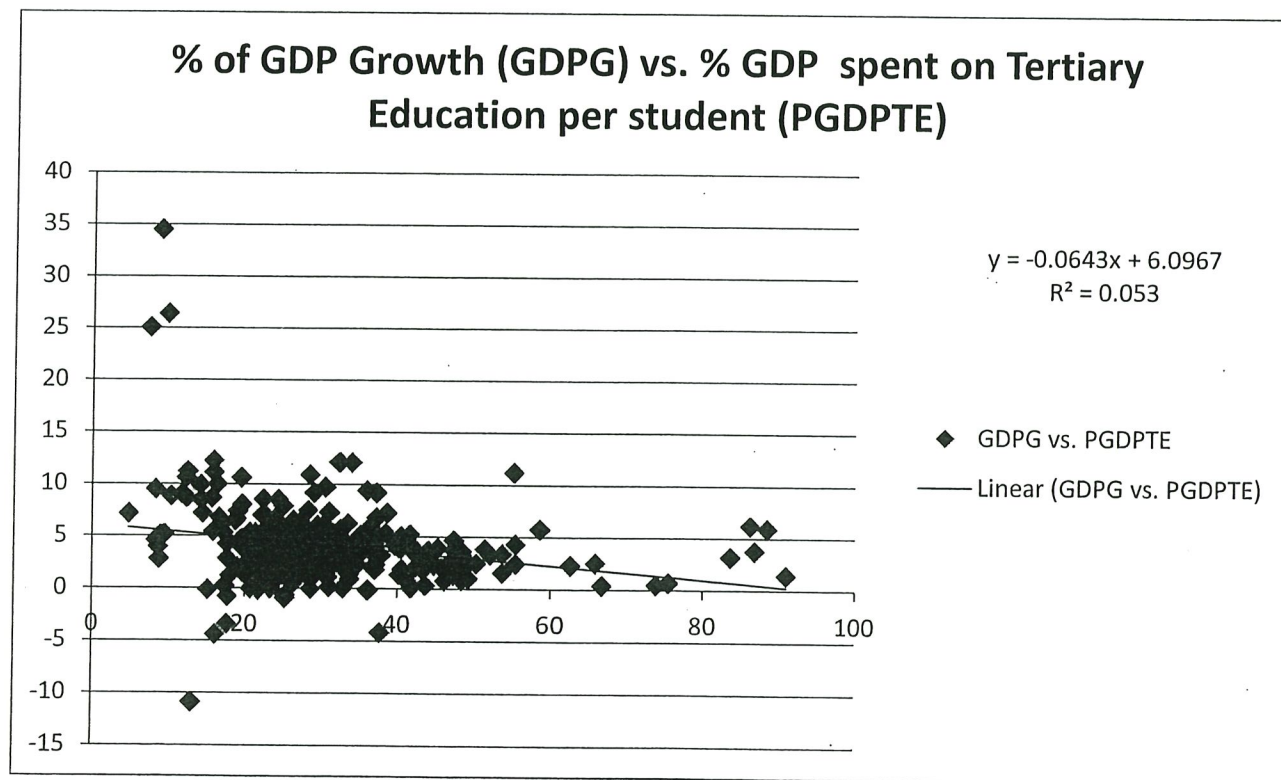
Table 3: Multiple Linear Regression of PGDPTE on GDP Growth

<i>Regression Statistics</i>	
Multiple R	0.230247052
R Square	0.053013705
Adjusted R Square	0.049328933
Standard Error	3.890660875
Observations	259

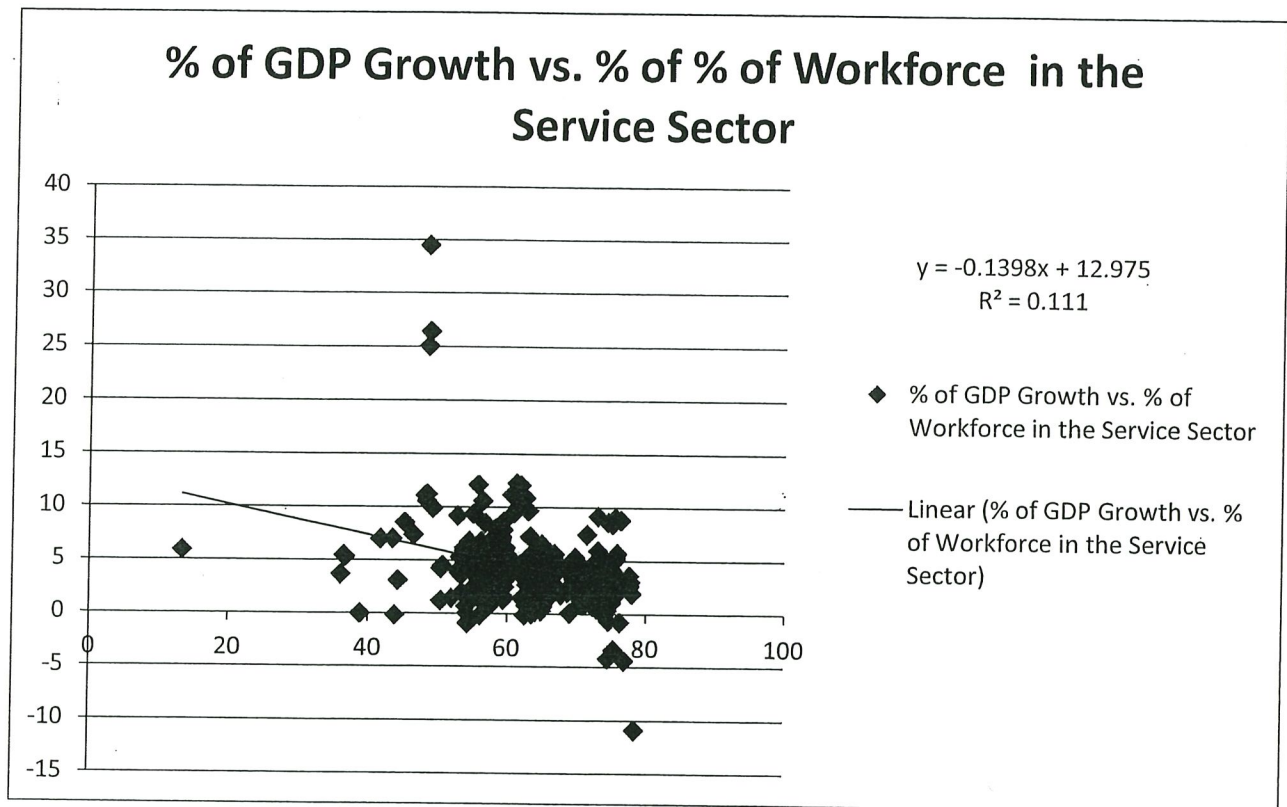
ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	217.7831837	217.7831837	14.38724326	0.000185566
Residual	257	3890.271206	15.13724204		
Total	258	4108.054389			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	6.096739682	0.573973767	10.62198315	4.35773E-22
PGDPTE	-0.064302635	0.016952743	-3.793051972	0.000185566

Graph 1



Graph 2



Discussion

At first glance, our results hint at a decreasing economic growth rate resulting from increasing tertiary expenditure per student (as a percentage of GDP per capita) and increasing the percentage of the workforce employed in the service sector. However, many considerations must be made before any conclusions can be drawn from the resulting data. The data collected comes from 31 countries out of roughly 196 countries in the world. Having reliable data from a larger data set would likely help solidify results. Another consideration to be made is the economic status of the countries used in the analysis. If a higher number of developed countries exist in proportion to underdeveloped countries, the data set could be slightly biased towards more developed countries that are able to keep more accurate and sufficient records. This makes

sense intuitively because more developed countries that already invest efficiently in educational resources will gain little compared to underdeveloped countries that possess less than average school systems, but “simply investing more public and private resources in the fields of knowledge and education does not guarantee equal growth opportunities” (Sterlacchini 2008).

Although our results further support Baumol’s earlier hypothesis using the latest data available on the macroeconomic level, further research is needed to fully understand the productivity levels of various service industries. Research has shown that the productivity growths are different for different industries as well as whether these industries have competition from foreign countries. It appears that service industries that have no or little competition from foreign countries show less productivity growth. For example, the Indian service sector enjoyed a 7.8% growth in 2007-2008. The service industries that grow faster than the overall economy include information technology (IT), IT-enabled services, telecommunications, financial service, community services, hospitality services (hotels and restaurants). All the above-mentioned sectors, except possibly the last two, compete with foreign firms. Moreover, IT enjoyed the fastest growth.

Conclusion

Although investing in education alone does not guarantee equal growth opportunities, empirical evidence supports the idea that societies stand to gain much from investments that will advance the overall quality of their schools. Still, further research is needed to determine how this quality can be most effectively achieved. The merit of this research involves the use of the most recent economic data available, where previous studies focused on earlier years. Also, the statistical significance that exists between the independent variables (PGDPTE and SERP) on

economic growth suggests that further investigation into these two areas may offer better guidance in terms of economic policy that could contribute to improved long-term economic competitiveness.

The service sector makes up a very high proportion of most major economies throughout the world. However, the impact of the service sector on productivity is not fully understood, when compared to manufacturing. A better understanding of the impact of the service sector is vital for countries with high level of service industries as well as for countries with increasing service sector because it can further enhance competitiveness and the standard of living for countries with high service industries component.

The purpose of this research is to try to further understand the overall impact of the service sector as well as the public expenditure of tertiary education (per student as a percentage of GDP per capita) on the GDP growths of various countries throughout the world. Specifically, we looked at how the percentage of the workforce employed in the service sector affects the productivity growth of different countries. We also looked at the relationship between public tertiary educational expenditure per student and economic growth. Our results show that the percentage of the service sector as well as public tertiary educational expenditure (per student as a percentage of GDP per capita) is negatively-related to productivity growth.

Future Research

The results presented in this study are based on macroeconomic data, and does not look at individual countries based upon any certain criteria, but rather as a whole. In order to gain a new perspective on the effects of the previously tested variables on economic growth that could further enhance research in the field, many different approaches could be taken. First, dividing

up the original country list into three of four subcategories, based upon their income or productivity levels, and then observing the possible relationships that exist between the independent variables and the respective country-group or subdivision (i.e. high income, average income, and low income) could serve to provide a new perspective on the study of productivity.

Regarding the impact of the services sector, as Baumol and others have discovered, differentiating between types of services is important in further understanding their collective impact on economic growth. Interesting observations might be found in separating these dissimilar services into its major components (i.e. health, transportation and education), and analyzing their individual significance with respect to economic growth. Although much research has been conducted and progress made in the field, future work controlling for these and other variables is vital to long-term global competitiveness.

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GDP growth (% of GDP per capita)

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007
Argentina	-3.39	-0.79	-4.41	-10.89	8.84	9.03	9.18	8.47	8.65
Austria	3.34	3.65	0.52	1.65	0.8	2.54	2.46	3.6	3.73
Azerbaijan	7.4	11.1	9.9	10.6	11.2	10.2	26.4	34.5	25.05
Brazil	0.25	4.31	1.31	2.66	1.15	5.71	3.16	3.96	6.09
Colombia	-4.2	4.42	1.68	2.5	3.92	5.33	4.71	6.7	6.9
Croatia	-1.04	3.75	3.66	4.88	5.37	4.13	4.28	4.94	5.06
Cuba	6.19	5.92	3.19	1.43	3.79	5.77	11.2	12.07	7.26
Cyprus	4.85	5.04	3.99	2.1	1.91	4.2	3.95	4.14	4.45
Czech Republic	1.34	3.65	2.46	1.9	3.6	4.48	6.32	6.81	6.13
Denmark	2.56	3.53	0.7	0.47	0.38	2.3	2.45	3.39	1.58
Finland	3.9	5.34	2.29	1.82	2	4.11	2.92	4.41	5.33
France	3.29	3.68	1.84	0.93	0.9	2.54	1.83	2.47	2.29
Hungary	4.23	6.22	4.1	4.4	4.3	4.7	3.9	0.76	0.77
Iceland	4.09	4.32	3.92	0.14	2.41	7.7	7.48	4.6	5.95
Ireland	10.9	9.71	5.7	6.55	4.41	4.6	6.02	5.32	5.63
Israel	3.3	9.2	-0.04	-0.66	1.51	5	5.1	5.7	5.31
Italy	1.46	3.69	1.82	0.45	-0.02	1.53	0.66	2.04	1.48
Japan	-0.14	2.86	0.18	0.26	1.41	2.74	1.93	2.04	2.36
Korea, Rep.	9.49	8.49	3.97	7.15	2.8	4.62	3.96	5.18	5.11
Kyrgyz Republic	3.66	5.44	5.33	-0.02	7.01	7.03	-0.18	3.1	8.54
Latvia	4.7	6.91	8.04	6.47	7.2	8.68	10.6	12.23	9.98
Mexico	3.87	6.6	-0.16	0.83	1.35	4.05	3.21	5.15	3.26
Netherlands	4.68	3.94	1.93	0.08	0.34	2.24	2.05	3.39	3.92
Norway	2.03	3.25	1.99	1.5	1.01	3.86	2.74	2.28	2.73
Poland	4.52	4.25	1.21	1.44	3.87	5.34	3.62	6.23	6.79
Portugal	4.08	3.93	1.97	0.71	-0.93	1.56	0.76	1.44	2.39
Slovak Republic	0.03	1.37	3.48	4.59	4.78	5.03	6.67	8.5	10.58
Spain	4.75	5.05	3.65	2.7	3.1	3.27	3.61	4.02	3.57
Ukraine	-0.2	5.9	9.2	5.2	9.4	12.1	2.7	7.3	7.9
United Kingdom	3.47	3.92	2.46	2.1	2.81	2.95	2.17	2.79	2.68
United States	4.87	4.17	1.09	1.83	2.5	3.58	3.06	2.67	1.94

Source: databank.worldbank.org

Public Expenditure on Total Education (% of GDP per capita)

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007
Argentina	4.52	4.6	4.83	4.02	3.54	3.78		4.52	4.93
Austria	6.29	5.75	5.79	5.72	5.57	5.52	5.48	5.45	5.37
Azerbaijan	4.21	3.85	3.5	3.15	3.29	0	2.35	1.99	1.69
Brazil	3.88	4.01	3.88	3.78	4.6	4.01	4.53	4.95	5.08
Colombia	4.44	3.49	3.69	4.25	4.31	4.08	3.99	3.89	4.06
Croatia	0	4.18	4.32	3.86	3.93	3.87	4.31	4.27	4.02
Cuba	6.76	7.7	8.36	9.57	9.94	10.27	10.56	9.06	11.87
Cyprus	5.12	5.35	5.5	6.04	7.29	6.7	6.92	7.02	6.93
Czech Republic	3.97	3.97	4.09	4.32	4.51	4.37	4.26	4.6	4.2
Denmark	8.11	8.29	8.44	8.44	8.33	8.43	8.3	7.97	7.83
Finland	6.1	5.9	6.07	6.22	6.44	6.43	6.31	6.19	5.9
France	5.79	5.67	5.57	5.55	5.88	5.81	5.65	5.58	5.59
Hungary	4.66	4.8	4.98	5.27	5.86	5.43	5.47	5.42	5.19
Iceland	0	5.81	6.24	7.23	7.71	7.48	7.59	7.55	7.36
Ireland	4.24	4.28	4.27	4.29	4.38	4.7	4.75	4.76	4.9
Israel	6.79	6.49	6.78	6.93	6.78	6.35	6.11	6.08	5.9
Italy	4.7	4.47	4.86	4.62	4.74	4.58	4.43	4.73	4.29
Japan	3.59	3.67	3.62	3.64	3.7	3.66	3.52	3.48	3.46
Korea, Rep.	3.76	0	4.12	4.01	4.37	4.36	4.15	4.22	4.23
Kyrgyz Republic	4.09	3.51	3.85	4.45	4.48	4.62	4.87	5.55	6.47
Latvia	5.73	5.36	5.48	5.75	5.32	5.07		5.07	5
Mexico	4.41	4.86	5.16	5.3	5.28	4.87	5.01	4.81	4.81
Netherlands	4.9	4.96	5.06	5.18	5.42	5.46	5.48	5.46	5.32
North America	5.36	5.56	5.38	5.38	5.77	5.51	5.1	5.61	5.18
Norway	7.11	6.58	6.95	7.58	7.54	7.47	7.02	6.55	6.76
Poland	4.65	5.01	5.33	5.41	5.35	5.41	5.47	5.25	4.91
Portugal	5.1	5.22	5.4	5.35	5.39	5.16	5.23	5.09	0
Slovak Republic	4.18	3.93	4	4.31	4.3	4.2	3.85	3.8	3.62
Spain	4.38	4.28	4.23	4.25	4.28	4.25	4.23	4.27	4.35
Ukraine	3.62	4.17	4.68	5.43	5.6	5.31	6.06	6.21	5.28
United Kingdom	4.53	4.51	4.62	5.17	5.32	5.23	5.42	5.55	5.47
United States	5.04	0	5.67	5.61	5.77	5.51	5.27	5.61	5.45

source: databank.worldbank.org

Public expenditure on tertiary education (% of GDP per capita)

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007
Argentina	17.69	17.73	16.11	13.06	10.35	11.78	0	14.24	15.64
Austria	52.15	44.12	41.57	46.66	46.26	49.42	50.32	48.41	47.43
Azerbaijan	19.1	15.91	14.15	12.35	12.46	0	9.83	8.9	7.51
Brazil	57.14	55.49	47.4	44.57	0	32.61	35	0	29.65
Colombia	37.73	29.58	30.33	23.43	0	20.68	19.41	18.89	0
Croatia	35.82	42.42	0	29.18	26.56	25.67	25.8	26.42	25.23
Cuba	86.2	88.46	83.61	90.99	86.82	58.66	55.25	34.07	38.62
Cyprus	31.66	40.51	27.56	29.56	40.54	34.23	28.56	39.66	36.97
Czech Republic	33.73	30.49	31.12	31.01	33.3	30.09	27.23	37.29	30.48
Denmark	65.86	70.18	75.51	73.91	66.73	62.55	55.5	53.73	53.76
Finland	40.52	38.44	37.09	37.04	36.85	36.07	34.4	33.38	31.67
France	29.68	29.17	28.64	28.86	33.8	33.95	33.16	33.32	34.85
Hungary	34.24	33.55	32.4	31.92	31.45	24.34	23.89	23.8	23.83
Iceland	0	30.11	30.07	31.17	28.85	27.54	28.39	26.22	27.37
Ireland	28.62	30.68	28.29	26.42	23.96	23.81	24.66	26.09	26.18
Israel	30.93	29.19	28.75	25.39	27.8	23.63	22.58	22.8	22.74
Italy	27.56	26.62	24.98	26.35	23.45	22.67	22.2	23.34	22.13
Japan	15.12	17.7	17.42	17.37	19.88	20.8	19.22	19.06	20.13
Korea, Rep.	8.37	0	0	4.8	8.82	8.42	8.68	9.51	9.04
Kyrgyz Republic	24.33	15.8	17.26	20.81	22.32	22.73	21.81	22.19	22.49
Latvia	27.94	22.66	19.65	18.74	14.43	12.36		15.85	16.35
Mexico	47.84	0	36.16	48.42	40.22	37.19	37.79	35.26	37.03
Netherlands	47.43	45.37	43.2	41.79	43.71	43.47	42.4	42.34	40.24
North America	26.77	0	30.95	25.29	26.23	23.1	23.07	24.96	21.72
Norway	45.83	39.32	43.63	47.99	49.25	51.45	49.1	44.85	47.25
Poland	21.09	17.65	18.03	21.11	19.73	21.43	21.43	17.1	16.58
Portugal	27.14	25.9	26.38	24.09	25.35	22.61	26.26	27.94	0
Slovak Republic	32.87	28.61	30.65	30.7	28.78	32.12	24.02	24.48	19.53
Spain	19.64	20.54	21.44	21.88	22.66	22.57	22.69	23.42	25.09
Ukraine	0	36.48	37.24	41.67	36.05	32.43	32.3	31.17	25.14
United Kingdom	25.61	22.95	22.69	28.16	27.25	26.74	31.63	28.77	24.38
United States	26.77	0	30.95	25.29	26.23	23.1	23.07	24.96	21.72

source: databank.worldbank.org

Public expenditure on R&D (% of GDP)

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007
Argentina	0.45	0.44	0.42	0.39	0.41	0.44	0.46	0.49	0.51
Austria	1.9	1.94	2.07	2.14	2.26	2.26	2.44	2.46	2.54
Azerbaijan	0.39	0.34	0.34	0.3	0.32	0.3	0.22	0.17	0.17
Brazil	0	1.02	1.04	0.98	0.96	0.9	0.97	1	1.1
Colombia	0.2	0.12	0.12	0.13	0.15	0.16	0.16	0.16	0.16
Croatia	0.85	1.07	0.93	0.96	0.97	1.05	0.87	0.76	0.81
Cuba	0.51	0.45	0.53	0.53	0.54	0.56	0.51	0.41	0.44
Cyprus	0.23	0.24	0.25	0.3	0.35	0.37	0.4	0.43	0.45
Czech Republic	1.14	1.21	1.2	1.2	1.25	1.25	1.41	1.55	1.54
Denmark	2.18	0	2.39	2.51	2.58	2.48	2.46	2.48	2.56
Finland	3.16	3.35	3.3	3.36	3.43	3.45	3.48	3.45	3.47
France	2.16	2.15	2.2	2.23	2.17	2.15	2.1	2.1	2.04
Hungary	0.69	0.78	0.92	1	0.93	0.88	0.94	1	0.96
Iceland	2.3	2.67	2.95	2.95	2.82	0	2.77	2.99	2.7
Ireland	1.18	1.12	1.1	1.1	1.17	1.24	1.25	1.25	1.28
Israel	3.58	4.32	4.6	4.59	4.32	4.26	4.37	4.41	4.76
Italy	1.02	1.05	1.09	1.13	1.11	1.1	1.09	1.13	1.18
Japan	3.02	3.04	3.12	3.17	3.2	3.17	3.32	3.4	3.44
Korea, Rep.	2.25	2.3	2.47	2.4	2.49	2.68	2.79	3.01	3.21
Kyrgyz Republic	0.18	0.16	0.17	0.2	0.22	0.2	0.2	0.23	0.23
Latvia	0.36	0.44	0.4	0.42	0.38	0.42	0.56	0.7	0.59
Mexico	0.43	0.37	0.39	0.44	0.4	0.4	0.41	0.39	0.37
Netherlands	1.96	1.82	1.8	1.72	1.76	1.81	1.79	1.78	1.72
North America	2.61	2.69	2.72	2.62	2.61	2.54	2.57	2.59	2.64
Norway	1.64	0	1.59	1.66	1.71	1.59	1.52	1.52	1.64
Poland	0.69	0.64	0.62	0.56	0.54	0.56	0.57	0.56	0.57
Portugal	0.71	0.76	0.8	0.76	0.74	0.77	0.81	1.02	1.21
Slovak Republic	0.66	0.65	0.63	0.57	0.57	0.51	0.51	0.49	0.46
Spain	0.86	0.91	0.91	0.99	1.05	1.06	1.12	1.2	1.27
Ukraine	0.97	0.96	1.02	1	1.11	1.08	1.03	0.95	0.85
United Kingdom	1.82	1.81	1.79	1.79	1.75	1.69	1.73	1.76	1.82
United States	2.66	2.75	2.76	2.66	2.66	2.58	2.61	2.65	2.72

source: databank.worldbank.org

Percentage of Total Workforce employed in the Service Sector (%)

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007
Argentina	75.3	76.2	76.9	78.5	76.3	75.5	75.1	75.1	74.5
Austria	63.4	63.8	64.6	64.9	65	67.1	66.7	66.2	66.8
Azerbaijan	46.5	48.1	49.2	48.3	48.4	48.5	48.6	48.3	48.4
Brazil	56.5	59.1	59.4	57.8	58.2	57.8	57.9	59.1	59.5
Colombia	74.5	73.3	59.4	59.6	60.4	60.3	58.9	59	62
Croatia	52.8	56.5	54.3	55	53.3	53.7	54	56.3	56.3
Cuba	53.8	53.8	58.1	58.1	58.1	59.4	60.6	61.8	63.2
Cyprus	70.1	70	70.6	70.6	71.2	70.8	70.3	72.3	72.3
Czech Republic	54.6	55.3	55.1	55.5	56.1	56.5	56.5	56.2	56.2
Denmark	70.2	71.3	72.3	72.9	73.2	72.7	73.5	73.8	74.4
Finland	66	66.3	67.2	67.6	68.6	69.3	69.4	69.7	69.7
France	69.4	69.5	69.8	70.4	71.1	71.8	72.3	72.3	73.1
Hungary	58.9	59.7	59.5	59.6	61.2	61.9	62.6	62.8	62.7
Iceland	67.4	68	68.7	69	70.9	70.9	71.4	72.1	73
Ireland	62.5	62.9	63.5	64.8	65.4	65.6	65.5	66.3	66.7
Israel	72.1	73	73.9	74.6	75.1	75	75.6	75.8	75.6
Italy	62.1	62.9	62.9	63.4	63.4	64.9	65	65.5	65.8
Japan	62.5	63.1	63.9	64.8	65.1	66	66.4	66.6	66.7
Korea, Rep.	60.9	61.2	62.5	63.3	63.5	64.3	65.1	65.9	66.8
Kyrgyz Republic	36.1	36.5	36.7	38.9	41.7	43.5	43.9	44.3	45.2
Latvia	57.5	59.1	58.3	59	59.2	59.4	61.8	61.3	61.5
Mexico	53.6	55.1	56.1	57.3	58.4	58.9	58.9	59.2	59.9
Netherlands	70.5	70.4	71.1	68.9	74.4	72.9	72.4	73.2	74.7
North America	74.1	74.3	75	75.5	77.2	77.3	77.5	77.5	77.8
Norway	73.1	73.6	74	74.2	74.3	75.5	75.7	75.8	75.8
Poland	50.6	50.4	50.4	52	53	53.2	53.4	54.2	54.5
Portugal	53	53	53.5	54.1	54.3	56.6	57.5	57.7	57.8
Slovak Republic	54.2	56.1	56.2	55.4	55.8	55.7	56.3	56.8	56.4
Spain	62.1	62.5	62	62.8	63.4	64.1	65	65.6	66.2
Ukraine	14.3	13.3	52.8	54.2	55.1	55.7	56.4	58.2	59.4
United Kingdom	72.5	73	73.8	74.6	75.3	76.2	76.2	76.4	76
United States	74.2	74.3	75	75.6	77.5	77.6	77.8	77.7	78

source: databank.worldbank.org

Total GDP per capita

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007
Argentina	7,759	7,696	7,203	2,710	3,410	3,994	4,736	5,486	6,624
Austria	26,359	23,866	23,642	25,478	31,047	35,358	36,792	38,919	44,850
Azerbaijan	574	655	704	763	884	1,045	1,578	2,473	3,851
Brazil	3,413	3,696	3,130	2,812	3,042	3,610	4,743	5,793	7,197
Colombia	2,204	2,524	2,443	2,391	2,274	2,765	3,405	3,726	4,676
Croatia	5,060	4,856	5,192	5,974	7,690	9,237	10,090	11,229	13,372
Cuba	2,563	2,753	2,844	3,006	3,203	3,400	3,789	4,682	5,201
Cyprus	14,243	13,424	13,796	14,864	18,435	21,389	22,428	23,848	27,853
Czech Republic	5,854	5,521	6,049	7,376	8,950	10,721	12,168	13,887	16,858
Denmark	32,702	29,993	29,967	32,354	39,468	45,310	47,577	50,462	57,021
Finland	25,209	23,514	24,010	25,975	31,484	36,135	37,290	39,458	46,505
France	24,132	21,828	21,867	23,555	28,870	32,874	33,913	35,558	40,460
Hungary	4,693	4,690	5,221	6,546	8,325	10,099	10,924	11,199	13,713
Iceland	31,505	30,951	27,800	30,928	37,882	45,309	54,938	54,813	65,566
Ireland	25,645	25,427	27,111	31,226	39,540	45,559	48,523	52,220	59,489
Israel	18,088	19,836	19,112	17,201	17,774	18,629	19,372	20,676	23,257
Italy	21,096	19,269	19,609	21,326	26,164	29,700	30,332	31,614	35,641
Japan	34,495	36,789	32,210	30,745	33,113	36,051	35,627	34,148	34,264
Korea, Rep.	9,554	11,347	10,655	12,094	13,451	15,029	17,551	19,707	21,653
Kyrgyz Republic	257	279	308	322	381	434	478	546	726
Latvia	3,050	3,302	3,524	3,984	4,811	5,950	6,973	8,713	12,638
Mexico	4,885	5,817	6,139	6,324	6,740	7,224	7,973	8,831	9,485
Netherlands	26,033	24,180	24,969	27,111	33,177	37,458	39,122	41,459	47,771
North America	32,188	33,952	34,637	35,488	37,133	39,400	41,808	44,129	46,097
Norway	35,660	37,472	37,873	42,293	49,314	56,312	65,324	72,250	82,294
Poland	4,345	4,454	4,979	5,184	5,675	6,620	7,963	8,958	11,157
Portugal	12,396	11,443	11,662	12,720	15,460	17,596	18,122	18,996	21,845
Slovak Republic	5,547	5,326	5,632	6,435	8,514	10,410	11,377	12,809	15,608
Spain	15,476	14,422	14,958	16,611	21,037	24,461	26,042	27,989	32,130
Ukraine	636	636	781	879	1,049	1,367	1,829	2,303	3,069
United Kingdom	25,605	25,089	24,885	27,173	31,239	36,789	37,860	40,335	46,092
United States	33,332	35,081	35,898	36,797	38,196	40,309	42,534	44,663	46,406

source: databank.worldbank.org