

**TITLE: THE EFA DEVELOPMENT INDEX AND PER CAPITA GDP: A
QUANTILE REGRESSION APPROACH IN A CROSS-SECTION OF 123
COUNTRIES FOR YEAR 2007**

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Abstract

Using cross-section data of 123 countries for 2007, this paper examines the relationship between per capita GDP and the Education Development Index and its four components. The paper primarily uses the quantile regression method. The regression results show that the effect of per capita GDP varies across different quantiles with a higher effect for quantile .10. The results further reveal that the elasticity of the adult literacy rate and the elasticity of the survival rate to Grade 5 with respect to per capita GDP are significantly higher than elasticities of the net enrolment ratio and the Gender-Specific EFA Index.

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Keywords: Education Development Index, Quantile regression

1. Introduction

The World Conference on Education for All (EFA), held in Jomtien, Thailand in 1990, called for universalization of primary education and substantial reductions of illiteracy by the year 2000. In 2000, participants at the World Education Forum, held in Dakar, Senegal, re-affirmed their commitment to achieving Education for ALL by the year 2015 and established six goals: 1) Expand early childhood care and education; 2) provide free and compulsory education for all; 3) promote learning and life skills for young people and adults; 4) increase adult literacy by 50%; 5) achieve gender parity by 2005 and gender equality by 2015; and 6) improve the quality of education.

To evaluate each country's progress toward EFA goals, the UNESCO has developed the Education for ALL Development Index (EDI). The EDI incorporates four of the six EFA goals, selected on the basis of data availability.

The main objective of this paper is to quantify the relationship between the EDI and GDP per Capita based on cross-section data. The paper also explores the relationship between each of the four components of the EDI and the level of per capita GDP.

2. Data and Methodology

The EDI concentrates on the four most easily quantifiable EFA goals: universal primary education, adult literacy, the quality of education, and gender parity. To measure universal primary education, the total primary net enrolment ratio (NER) is used as proxy variable. The NER is defined as the percentage of primary school-age children who are

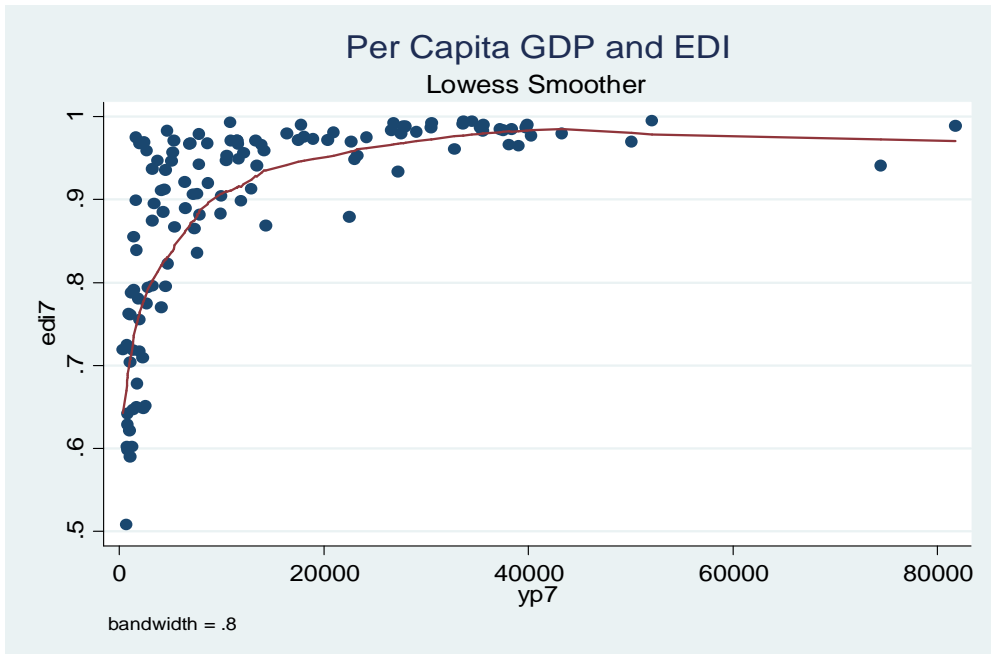
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enrolled in either primary or secondary school. The adult literacy rate (*alr*) is defined as the number of literate persons aged 15 and above as a percentage of total population in that age group. Given the problems of measuring the quality of education and limitations of data, the EDI uses the survival rate to grade 5 (*SR5*) as a proxy variable for the quality of education. It is defined as the number of students in a cohort reaching Grade 5 as a percentage of number of students in the same cohort enrolled in Grade 1. The fourth component of EDI is measured by a composite index, the gender-specific EFA index (GEI). The GEI is computed as a simple average of three gender parity indexes (GPI): 1) gender parity in the gross enrolment ratio in primary education (the ratio of female to male enrolment ratio), 2) gender parity in the gross enrolment ratio in secondary education (the ratio of female to male enrolment ratio), and 3) gender parity index in adult literacy. It should be noted that in the EDI, each of the four components is assigned equal weight. The EDI value can range from 0 to 1. The closer a country's EDI value is to the maximum, the greater the extent of its overall EFA achievement and the nearer the country is to the EFA goal.

Data on the EDI and its components are obtained from UNESCO (2010) and data on the GDP per Capita based on purchasing power parity from the *IMF World Economic Outlook* database October 2010. This paper uses data for the year 2007 pertaining to 123 countries.

Figure 1 depicts the relationship between the EDI (*edi7*) and per Capita GDP (*yp7*). It is evident that the relationship is non-linear: As the per Capita GDP becomes high (beyond US\$20,000), the EDI approaches its maximum value.

Fig. 1.



Given the non-linear relationship, this paper uses the logarithmic values of the two variables in regression analyses. This paper presents regression results based on the OLS method as well as on the quantile regression method. The OLS method specifies the change in the conditional mean of the dependent variable in response to a change in the predictor variable. In contrast, the quantile regression method predicts changes in the conditional quantile. The quantile regression model is a generalization of the median regression model. The quantile regression is more appropriate when : 1) researchers are interested in exploring non-central locations of the response variable, 2) there are outliers, 3) the error term is heteroscedastic, and 4) the distribution of the dependent variable is skewed (Hao and Naiman, 2007 ; Koenker and Hallock 2001).

3. Regression Results

Table 1 reports the OLS results where the per capita GDP in logs (*lyp*) is the independent variable. Since the variables are in log forms, the coefficient of *lyp* represents the elasticity of the relevant dependent variable. It is observed from Table 1 that the elasticity of the EDI with respect to per capita GDP is .093. The elasticity of the adult literacy rate (*alr*) with respect to per capita GDP is the highest with a value of .161, while the elasticity of the survival rate grade 5 is .108. The other two elasticities concerning the NER and GEI are comparatively lower.

Table 1. OLS results

Dependent variable	Intercept	<i>lyp</i>	R ²
<i>ledi</i>	-.957 (0.0)	.093(0.0)	.619
<i>lner</i>	-.700 (0.0)	.0666 (0.0)	.317
<i>lalr</i>	-1.636 (0.0)	.161 (0.0)	.481
<i>lgei</i>	-.657 (0.0)	.064 (0.0)	.457
<i>lsr5</i>	-1.114 (0.0)	.108 (0.0)	.511

Notes: *ledi* = the EDI index in logs, *lner* = the net enrolment ratio in logs, *lalr* = the adult literacy rate in logs, *lgei* = the gender-specific EFA index in logs, *lsr5* = the survival rate to grade 5 in logs, *lyp* = per capita GDP in logs. Figures in parentheses are *p*-values.

Table 2 displays results from quantile regressions.

In Panel A, regression results are shown for different quantiles with *ledi* as the dependent variable and *lyp* as the independent variable. The elasticity of the Education Development Index (EDI) with respect to per capita GDP (*yp*) varies from .1229 for quantile .10 to .017 for quantile .90. This suggests that the GDP per capita has greater impact on the EDI for countries with lower value of EDI.

Panel B of Table 2 reports the quantile regression results with *lner* as the dependent variable. The elasticity of the Net Enrolment Ratio (NER) with respect to per capita GDP for quantile .10 is .112 while the elasticity for quantile .90 is only .008. The low values of elasticity for higher quantiles suggest that at high levels of per capita GDP, the NER are already close to the maximum value.

Panel C of Table 2 shows the quantile regression results with *laln* as the dependent variable. It is evident that the elasticity of the adult literacy rate (*aln*) with respect to per capita GDP is comparatively high with a value of .251 at quantile .10. The elasticity drops to .005 at quantile .90.

Table 2 Quantile regression results

A. Dependent variable: *ledi*

Quantile	Intercept	<i>lyp</i>	Pseudo R ²
.10	-1.335 (0.0)	.1229 (0.0)	.557
.25	-1.157 (0.0)	.108 (0.0)	.505
.50	-.78 (0.0)	.074 (0.0)	.358
.75	-.40 (0.0)	.038 (0.0)	.177
.90	-.18 (0.0)	.017 (0.0)	.092

B. Dependent variable: *lnr*

Quantile	Intercept	<i>lyp</i>	Pseudo R ²
.10	-1.242 (.037)	.112 (.093)	.31
.25	-.700 (0.0)	.063 (0.0)	.256
.50	-.428 (0.0)	.039 (0.0)	.153
.75	-.241 (0.0)	.023 (0.0)	.08
.90	-.085 (0.0)	.008 (0.002)	.031

C. Dependent variable: *lnl*

Quantile	Intercept	<i>lyp</i>	Pseudo R ²
.10	-2.734(0.0)	.251 (0.0)	.454
.25	-1.730 (0.0)	.164 (0.0)	.372
.50	-1.033 (0.0)	.099 (0.0)	.271
.75	-.470 (0.0)	.046 (0.0)	.097
.90	-.054 (0.0)	.005 (0.0)	.017

Note: **p**-values are in parentheses.

Table 3 presents quantile regression results with *lgei* and *lsr5* as the dependent variables and *lyp* as the independent variable. Two points are noteworthy. First, the elasticities decline at higher quantiles. Second, elasticities are higher for *lsr5* than for *lgei*. For instance, the elasticity of the survival rate to grade 5 (*sr5*) with respect to per capita GDP at quantile .10 is .159 while the elasticity of Gender-Specific EFA Index (*gei*) with respect to per Capita GDP is .106.

Table 3 Quantile regression results

Dependent variable: *lgei*

Quantile	Intercept	<i>lyp</i>	Pseudo R ²
.10	-1.146 (0.0)	.106 (0.0)	.462
.25	-.729 (0.0)	.068 (0.0)	.355
.50	-.397 (0.0)	.037 (0.0)	.231
.75	-.219 (0.0)	.021 (0.0)	.129
.90	-.077 (0.0)	.007 (0.0)	.043

Dependent variable: *lsr5*

Quantile	Intercept	<i>lyp</i>	Pseudo R ²
.10	-1.725 (0.0)	.159 (0.0)	.425
.25	-1.387 (0.0)	.131 (0.0)	.411
.50	-.894 (0.0)	.086 (0.0)	.322
.75	-.403 (0.0)	.039 (0.0)	.147
.90	-.130 (0.0)	.012 (0.0)	.042

Note: **p**-values are in parentheses.

5. Conclusion

The main objective of this paper was to explore the impact of per capita GDP on the Educational Development Index (EDI) and its four components based on quantile regressions. The regression results reveal that the effect of per capita GDP varies across different quantiles with a higher effect for quantile .10, which the OLS method fails to highlight.

The quantile regression results further reveal that the elasticity of the adult literacy rate and the elasticity of the survival rate to Grade 5 with respect to per capita GDP are significantly higher than elasticities of the net enrolment ratio and the Gender-Specific EFA Index.

These results deserve some explanations.

First, many poor developing countries have managed to promote the Net Enrolment Ratio and Gender-Specific EFA Index with various monetary means and incentives. However, for these poor countries, progress in promoting adult literacy rate and quality of primary education (represented by the survival rate to Grade 5) has been slow. The slow progress in these two indicators can be attributed to low per capita GDP associated with high poverty rate of many households. The poverty trap for many families co-exists with adult illiteracy and high drop-out rates of primary school children.

References

Hao, L. and Naiman, D.Q. (2007) *Quantile Regression*. Thousand Oaks, CA. Sage Publications.

Koenker,R. and Hallock,K.F. (2001) Quantile regression, *Journal of Economic Perspectives*, **15**, 143- 56.

UNESCO (2010) *EFA Global Monitoring Report 2010*, Paris.