National Income, Public Expenditure on Education and Educational Attainment: A Comparative Analysis

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Abstract: A casual observation of the statistics on income and educational attainment among the different income groups suggests a perfect correlation between national income and educational attainment. Does this imply that richer countries spend more on education? What is the relationship between public expenditure on education and educational attainment? The study employs correlation analysis to evaluate how public expenditure on education varies with national income across income groups and over time; and secondly, to ascertain the relationship between public expenditure on education and educational attainment across income groups. The result shows high and positive correlation between national income and public spending on education at the global level over time. Except for high income countries that exhibited similar result, all other income groups produce weak and mixed results. Public expenditure on education shows weak correlation with educational attainment across income groups. This weak relationship was found to grow worse with time. This result points to the fact that aside the issues of efficient utilization of resources, other factors that influence educational attainment seem to be more effective.
Keywords: National Income, Public Expenditure, Education.

1. Introduction

Education at all levels has been found to have economic, social and non-market effects on individuals as well as the society at large. Aside improving total productivity, education has effect on health, fertility rate, income inequality, poverty, crime, political participation, environmental protection and drug use (Ridell, 2006; Schendel,

McCowan and Oketch, 2014). These factors influence economic growth either directly or indirectly

In spite of the numerous benefits stated above, the wide gap in educational achievements between the rich and poor countries has persisted. In 1970, average years of total schooling for New Zealand and Republic of Yemen were 11.33 and 0.06 respectively. Thus, the difference between the most educated and the least educated country in the world was 11.27. Four decades after, this level of disparity still persists. In 2010, average years of total schooling in the United States were13.09 while that of Mozambique was 1.81 (Barro and Lee 2010). A striking observation is that no African country had achieved an average years of total schooling of 10 as at 2010. Botswana – with 9.56 average years of total schooling - had the highest level of education in Africa. The development of education in Botswana has been remarkable. Average years of schooling in Botswana rose consistently from 2.14 in 1970, to 9.56 in 2010. This represents a difference of 7.42 years; the highest ever recorded between 1970 and 2010. The level of education in most low income countries is not only low; its pace of development is also slow.

As a merit good, the intervention of the public sector in the education sector becomes inevitable. Other rationale for public spending on education has been premised on the fact that education generates positive externalities. However, the level of public involvement – free and compulsory education at both primary and secondary levels – in most countries has been attributed to the *commodity egalitarianism hypothesis* which states that everyone should be provided a certain level of education regardless of cost (Rosen and Gayer, 2008). Just like educational achievement, there are wide variations in the level of government expenditure on education across countries. Available data shows that in 1999 the government of Lao spent $12 per secondary school student. In the same year, Denmark spent $12,462 per secondary school student which increased to $18,542 in 2009. Twelve years later (in 2011) this huge disparity still exists. Government expenditure per secondary school student in Madagascar was $47 while Switzerland spent $22,842 in 2011.

The size of government expenditure in general and on education in particular has been explained by two hypotheses in the literature - Wagner (1911) and Wiseman and Peacock

(1961).Wagner (cited in Lamartini and Zaghini, 2008) opined that there is both an absolute and relative expansion of public expenditure as an economy grows. On the other hand, Wiseman and Peacock (cited in Bhatia, 2008) argued that public expenditure does not increase in a smooth and continuous manner; rather, it grows in jerks and step like fashion. Such jerks were attributed to unforeseen circumstances such as flooding, earthquake or any other social disturbance. On the contrary, Wagner's argument was based on factors such as inflation, increasing social security and the need to provide and expand the sphere of public goods.

In view of Wagner's law available statistics on education by income groupings (Appendix 1a) shows a perfect correlation between the level of national income and that of educational attainment from 1999 to 2012. Currently, the World Bank classifies countries into low, lower middle, upper middle and high income economies. Low income countries are those with Gross National Income (GNI) per capita of $1,035 or less; Countries with per capita income of $1,036 to $4,085 are classified as lower middle income countries; Upper middle income countries are those with GNI per capita of $4,086 to $12,615; while

high income countries are those with $12,616 and more. Between 1999 and 2012, low income countries' secondary school enrolment rate rose from 29 percent to 44 percent, lower middle income from 46 percent to 65 percent, upper middle income from 67 percent to 88 percent and high income from 97 percent to 100 percent. A similar trend is also observed for tertiary education (see Appendix 1b).

The above trend implies that higher income countries spend more on education or the higher the level of national income, the higher the public expenditure on education and by implication, the higher the level of education. However, available data show that a number of countries in lower income groupings spend more on education per student than some in higher income groupings (UIS, 2014) Also, some countries with lower expenditure on education per student have higher educational attainment. These observations have raised two research questions: i) by how much does public expenditure on education vary with national income? ii) What is the correlation between education expenditure and educational attainment?

Thus, the objective of this study is two-fold: first, to ascertain how public expenditure on education varies with national income across

income groups and over time; and second, to ascertain the correlation between public expenditure on education and educational attainment across income groups.

2. Related Literature
2.1 Economic Growth and Public Expenditure

In general, Wagner's law states that the share of government expenditure in GNP will increase with economic growth. This hypothesis has been tested and supported by researchers under different circumstances and sectors. Oyinlola and Akinnibosun (2013) introduced the concept of structural breaks and tested the hypothesis in Nigeria. Total public spending was disaggregated into functional areas. Their result confirmed Wagner's hypothesis in the two eras identified. Kuckuck (2012) tested Wagner's hypothesis at different stages of economic development. He found that the law loses its relevance with increase in economic development. Ibok and Bassey (2014) examined the consistency of Wagner's law on public expenditure on the agricultural sector in Nigeria. Applying the Johansen and Juselius cointegration test, they found that Wagner's law holds in the Nigerian agricultural sector.

2.2 Public Expenditure on Education and Educational Attainment

Urhie (2015) provides a detailed review of studies which examined the effect of public education expenditure on the level of educational attainment. While Gupta, Verhoeven and Tiongson, (1999); McMahon, (1999); Lopes, (2002); Anyanwu and Erhijakpor, (2007); Baldacci et al, (2008); Amin and Ntilivamunda, (2009); Diawara (2009); and Fadiya, (2010) found a strong relationship between public spending and education, Landau, (1986); Noss, (1991); Anand and Ravallion, (1993) and Al-Samarrai (2002) found a weak relationship. Al–Samarrai (2002) attributed it to poor data, omitted variables and inefficient resource utilization, Woβmann (2001) and Diawara (2009) identified the state of development of the country or region concerned as a limiting factor. It is believed that resources may render positive effects at very low endowment levels prevailing in many developing countries.

Other determinants such as per capita income, family background or parental education have also been identified as key determinants of educational attainment other than education expenditure.

3. Method of Analysis

The study used education from UNESCO for the period 1999 to 2012. Emphasis of this study is on

public expenditure on education and educational attainment. National income data was obtained from The World Bank, World Development Indicators. Available data informed the choice of period and number of countries for the analysis. In 1999, 58 countries reported data for public expenditure on education while 91 countries reported in 2011. Gross national income per capita (GNIPC) was used to represent income, while government expenditure per secondary school student (GEPSS) was used to represent public sector investment in education. Gross secondary school enrolment captures the level of educational attainment.

Correlation analysis between national income and public expenditure on education and between public expenditure and educational attainment were conducted using the Eviews 7.0 software. Averages on the basis of income groupings were also conducted. Global statistics for the two extreme periods were compared. Comparisons were also conducted among income groups.

The 58 countries considered in 1999 are Algeria, Argentina, Austria, Bangladesh, Barbados, Belize, Bolivia, China, Colombia ,Costa Rica, Cote d'ivoire, Cuba, Cyprus, Czech Republic,

Denmark, Ecuador, Finland, France, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Jordan, Lao PDR, Latvia, Lesotho, Malawi, Mali, Mauritania, Mexico, Morocco, Namibia, Nepal, Netherland, New Zealand, Oman, Panama, Portugal, Rep. of Korea, Saint Lucia, Samoa, Slovakia, South Africa, Spain, Swaziland, Sweden, Switzerland, Syrian Arab Rep., Togo, Tunisia, UK and N. Ireland, United States of America, Uruguay and Vanuatu.

The 91 countries included in the analysis in 2011 are Algeria, Aruba, Australia, Austria, Bangladesh, Barbados, Belgium, Belize, Bhutan, Bolivia, Burkina Faso, Burundi, Cabo Verde, Cameroon, Canada, Chad, Chile, China Hong Kong, Colombia,Costa Rica, Cuba, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Estonia, Fiji, Finland, France, Greece, Guatemala, Guinea, Guyana, Hungary, Iceland, India, Indonesia, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Latvia, Lesotho, Lithuania, Madagascar, Malawi, Malaysia, Mali, Mauritania, Mauritius, Mexico, Mongolia, Morocco, Nepal, Netherlands, New Zealand, Niger, Oman, Panama, Paraguay, Peru, Portugal, Rep. of Korea, Rep. of Moldova, Romania, Rwanda,

Saint Lucia, Saint Vincent and grenadines, Samoa, Serbia, Seychelles, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Swaziland, Sweden, Switzerland, Syrian Arab Rep., Thailand, Togo, Tunisia, UK and N. Ireland, Ukraine, United States of America, Uruguay and Yemen.

4. Discussion

4.1. National Income and Public Expenditure on Education

Using global data the correlation between national income and public expenditure on education was found to be 0.956 and 0.958 in 1999 and 2011 respectively (See Table 1. below). This result follows Wagner's (1911) law which states a strong correlation between government expenditure and economic growth. However, Kuckuck (2012) finding could not be ascertained as there was no remarkable difference between the relationship in 1999 and that of 2011.

Results for all the income groups deviate from the global in one form or the other. The correlation for low income countries is 0.544 and 0.554 in 1999 and 2011 respectively. The result for lower middle income countries is similar to that of low income countries. This suggests that other factors could be responsible for the level of government expenditure to the educational sector in these countries. Upper middle income countries had a high correlation (0.811) in 1999 but dropped drastically to 0.363 in 2011. A similar experience though not as high as that of upper middle income countries was observed in lower middle income countries. This tends to confirm Kuckuck (2012) finding. The results for high income countries seem to tally with the global experience.

The ratio of government expenditure on education to national income ranged between 4% (Lao PDR) and 75% (Vanuatu) for the 58 countries considered in 1999. A similar range was observed in 2011; that is, between 5% (Guatemala) and 74% (Czech Republic) for the 91 countries considered.

Table 1. Correlation between National Income (GNIPC) and Public Expenditure on Education (GEPSS) by Income Groupings 1999 and 2011

GROUP	CORRELATION BETWEEN GNIPC AND GEPSS	
	1999	2011
LOW INCOME COUNTRIES	0.544	0.554
LOWER MIDDLE INCOME	0.414	0.344
UPPER MIDDLE INCOME	0.811	0.363
HIGH INCOME	0.809	0.914
WORLD	0.956	0.958

Source: Author's Computation (see Appendix 2a – 2e)

Another interesting observation is the global average for the two periods which is 24%. The average on the basis of income groupings in 1999 are 25%, 26%, 19% and 24% for low income, lower middle, upper middle and high income countries respectively. The values for 2011 are 28%, 22%, 20% and 25%.

4.2 Public Investment in Education and Educational Attainment

Globally, public expenditure per secondary school student (GEPSS) in 1999 ranged between $12 for Lao and $12,462 for Denmark. There is little wonder that secondary school enrolment rate in Denmark is 125 compared to 32 for Lao in the same year. In 2011, GEPSS ranged between $27 for Nepal and $22,842 for Switzerland. Similarly, secondary school enrolment rates for these countries were 27% and 96% respectively.

Secondary school enrolment rate among the 58 countries under consideration in 1999 ranged between 16% for Mali and 157% for Sweden. In 2011 the least enrolment rate of 15% was recorded by Niger while Australia recorded the highest rate of 133%.

Except for low income countries, the correlation between public expenditure on education and educational attainment declined between 1999 and 2011 in all the income groups. While the correlation in low income countries increased from -0.251 in 1999 to 0.138 in 2011 those of lower middle, upper middle and high income countries declined from 0.225, 0.579, and 0.305 in 1999 to 0.015, 0.291 and 0.198 in 2011 respectively. This result indicates that the relationship between public spending on education and educational attainment is non-linear. Thus, there is a diminishing marginal

return to investment in education – in terms of input and output (see Table 2 below).

Table 2. Correlation between Public Expenditure on Education (GEPSS) and Educational Attainment (GSSE) by Income Groupings 1999 and 2011

GROUP	CORRELATION BETWEEN GEPSS AND GSSE	
	1999	2011
LOW INCOME COUNTRIES	-0.251	0.138
LOWER MIDDLE INCOME	0.225	0.015
UPPER MIDDLE INCOME	0.579	0.291
HIGH INCOME	0.305	0.198
WORLD	0.706	0.496

Source: Author's Computation. (see Appendix 3a – 3e)

5. Concluding Remarks

The study examined the relationship between national income and public expenditure on education. Correlation analysis was conducted to test this relationship at the global level as well as across the different income groups. The high and positive correlation between national income and public spending on education at the global level over time - 0.956 and 0.958 in 1999 and 2011 respectively – has further buttressed Wagner's law. Except for high income countries that exhibited similar result, all other income groups produce mixed results. Worthy of note is the upper middle income countries. The correlation between national income and public spending on education actually declined from 0.811 in 1999 to 0.363 in 2011, thus supporting Kuckuck's finding.

Public expenditure on education showed a weak correlation with educational attainment across income groups. This weak relationship was found to grow worse with time. This result points to the fact that aside the issues of efficient utilization of resources, other factors that influence educational attainment seem to be more effective.

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Appendix1a. Gross Enrolment Ratio, Secondary, both sexes (%) by World Bank Income Groupings

YEAR	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Low income countries	29	30	31	33	33	34	34	36	37	39	41	42	43	44
Lower middle income countries	46	47	48	49	51	53	54	55	57	59	59	62	64	65
Middle income countries	56	57	57	59	60	61	63	64	66	68	69	72	74	74
Upper middle income countries	67	68	68	69	69	71	72	74	77	80	82	85	87	88
High income countries	97	98	98	99	99	97	98	97	97	98	98	99	100	100

Appendix 1b. Gross Enrolment Ratio, Tertiary, both sexes (%) by World Bank Income Groupings

YEAR	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
WB Income Groupings														
Low income countries	4	4	5	5	5	5	5	6	6	7	8	8	9	9
Lower middle income countries	11	12	12	13	13	14	14	15	16	17	18	19	22	23
Middle income countries	12	13	14	16	17	18	19	20	21	22	23	25	26	28
Upper middle income countries	14	15	17	19	21	22	24	25	26	27	28	30	32	34
High income countries	55	56	58	62	64	65	66	67	68	69	70	73	75	75

Source:UNESCO Institute for Statistics: www.uis.unesco.org

Appendix 2a: Correlation Matrix 1999; Global

	GEGNI	GEPSS	GNIPC	GSSE
GEGNI	1	0.11376	-0.01434	-0.26018
GEPSS	0.11376	1	0.95612	0.705638
GNIPC	-0.01434	0.95612	1	0.75208
GSSE	-0.26018	0.705638	0.75208	1

Appendix 2b: Correlation Matrix 1999; Low Income Countries

	GEGNI	GEPSS	GNIPC	GSSE
GEGNI	1	0.805595	0.075887	-0.58572
GEPSS	0.805595	1	0.54358	-0.25123
GNIPC	0.075887	0.54358	1	0.552492
GSSE	-0.58572	-0.25123	0.552492	1

Appendix 2c: Correlation Matrix 1999; Lower Middle Income Countries

	GEGNI	GEPSS	GNIPC	GSSE
GEGNI	1	0.756857	-0.25163	-0.60795
GEPSS	0.756857	1	0.414155	-0.22549
GNIPC	-0.25163	0.414155	1	0.42071
GSSE	-0.60795	-0.22549	0.42071	1

Appendix 2d: Correlation Matrix 1999; Upper Middle Income Countries

	GNIPC	GEPSS	GSSE	GEGNI
GNIPC	1	0.811014	0.748494	0.006006
GEPSS	0.811014	1	0.578663	0.558731
GSSE	0.748494	0.578663	1	-0.03039
GEGNI	0.006006	0.558731	-0.03039	1

Appendix 2e: Correlation Matrix 1999; High Income Countries

	GEGNI	GEPSS	GNIPC	GSSE
GEGNI	1	0.642919	0.102458	0.164476
GEPSS	0.642919	1	0.808895	0.305372
GNIPC	0.102458	0.808895	1	0.254454
GSSE	0.164476	0.305372	0.254454	1

Appendix 3a: Correlation Matrix 2011; Global

	GEGNI	GEPSS	GNIPC	GSSE
GEGNI	1	0.248812	0.099869	-0.10956
GEPSS	0.248812	1	0.958367	0.496332
GNIPC	0.099869	0.958367	1	0.54101
GSSE	-0.10956	0.496332	0.54101	1

Appendix 3b: Correlation Matrix 2011; Low Income Countries

	GEGNI	GEPSS	GNIPC	GSSE
GEGNI	1	0.684854	-0.14836	-0.13262
GEPSS	0.684854	1	0.55455	0.138058
GNIPC	-0.14836	0.55455	1	0.314783
GSSE	-0.13262	0.138058	0.314783	1

Appendix 3c: Correlation Matrix 2011; Lower Middle Income Countries

	GEGNI	GEPSS	GNIPC	GSSE
GEGNI	1	0.817551	-0.18	-0.2025
GEPSS	0.817551	1	0.344453	0.014591
GNIPC	-0.18	0.344453	1	0.346783
GSSE	-0.2025	0.014591	0.346783	1

Appendix 3d: Correlation Matrix 2011; Upper Middle Income Countries

	GEGNI	GEPSS	GNIPC	GSSE
GEGNI	1	0.891005	-0.0698	0.179714
GEPSS	0.891005	1	0.3634	0.290669
GNIPC	-0.0698	0.3634	1	0.24691
GSSE	0.179714	0.290669	0.24691	1

Appendix 3e: Correlation Matrix 2011; High Income Countries

	GEGNI	GEPSS	GNIPC	GSSE
GEGNI	1	0.616803	0.278595	0.183318
GEPSS	0.616803	1	0.91382	0.197639
GNIPC	0.278595	0.91382	1	0.164417
GSSE	0.183318	0.197639	0.164417	1