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The Effects of Government Education Expenditure on Import Dynamics: Large Scale Cluster Analysis

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Abstract

The ratio of direct budget allocations and indirect expenditures on higher education depends on the existing systems of tuition fees, forms of support for higher education, encouragement of student mobility, their age and social status. In Denmark and Norway, 32.2% and 36.7% of funds are allocated to support students and ensure their financial independence. Such financial policies create incentives for young people to continue their education. In these countries, more than 15% of university and doctoral students are over 35 years old. Current research denotes relationship among import and government education expenditure in cross sectional secondary source data by World Bank. For a literature review we used Elicit AI database for further theoretical approach. Data sampling was selected 185 countries with import level, expenditure on education, export level, IMF credits, access to electricity and credit private sector. For statistic analysis we used STATA 17.0 and for cluster analysis SPSS 22.0 software. From the econometric model it has been used OLS, OLS Robust, Marginal effect and Logarithmic transformation models. Highly significant countries analyzed based on cluster effect analysis and estimaed each distances between final cluster centers among countries. For the final conclusion it has been groupped 3 clasters from the import level on government education expenditure. Cluster 3 included advanced economis, for a cluster 2 transition economis and developing economis. And the last cluster 1 classified small countries and low middle income countries.

Keywords. education, economic potentials, marginal effect, cluster analysis, import

1. Introduction

Among human rights and freedoms, the right of citizens to education occupies a special place. One of the important, one can say the central components of the social sphere is the education

system. The importance of the education system can be explained by the fact that the activity of this field determines the socio-economic development in the long term. Government expenditure in education give a significant economic result, but for different groups of countries, the effect of investments in higher, secondary and primary education is different. In developed countries, an increase in spending on all types of education leads to economic growth, with higher returns on secondary and tertiary education. For developing countries, higher spending on primary and secondary education has a bigger effect.

Economic effects arising from differences in quality primary and secondary education are even less studied than the effects from differences in the quantitative characteristics of education, especially at the aggregate level. This phenomenon occurs due to problems with education quality statistics. It seems reasonable to evaluate the quality of general education in terms of the level of knowledge and analytical abilities of schoolchildren. Using standard test results at the same time, it is rather controversial, primarily due to differences in preparation for the test system of knowledge assessment.

Table 1. Literature review of the research

№	Paper title	Abstract summary	Main findings	Outcomes measured
1	The effects of government expenditure on imports in the Eurozone reconsidered: evidence from panel data Ioanna Konstantakopoulou	An increase in government expenditure leads to an increase in imports.	• The components of government expenditure have different impacts on imports demand. • An increase in government expenditure leads to an increase in imports. • Government expenditure has a lower import context than other expenditure components[1].	•Imports
2	Impact of educational expenditure on economic growth in major Asian countries: Evidence from econometric analysis Lingaraj Mallick, P. Das, Kalandi Charan Pradhan 2016 53 Citations	Education sector is one of the important ingredients of economic growth in all 14 major Asian countries.	• The results of Pedroni cointegration state the existence of long-run equilibrium relationships between expenditure on education and economic growth in all the countries. • The FMOLS results revealed a positive and statistically significant impact of education expenditure on economic development of all the 14 Asian countries[2].	•Economic Growth
3	Public education expenditures and growth William F. Blankenau, Nicole B. Simpson 2004 256 Citations	The positive direct effect of public education spending on growth can be diminished or even negated when other determinants	• The relationship between public education expenditures and economic growth is complex and depends on the level of government spending, the tax structure, and the parameters of production technologies[3].	•Economic Growth
4	The Impact of Education Expenditure on India's Economic Growth Pravesh Tamang 2011 27 Citations	A 1% increase in physical capital per labour will lead to 0.28% increase in GDP per labour.	• A 1% increase in physical capital per labour will lead to 0.28% increase in GDP per labour, and a 1% increase in government expenditure on education per labour will lead to 0.11% increase in GDP per labour[4].	•Economic Growth (Measured By Gdp Per Labour)
5	Dynamics Of The Share Of Education Expenditures Within Romania's Gross Domestic Product - Economic And Social Effects	Education is the basic foundation of social, cultural, and economic development.	• Education expenditures in Romania have increased significantly since the 1990s, reaching a peak of 6.2% of the GDP in 2018. • This increase in education spending has had a positive effect on the economic and social development of Romania, with improved educational	•Evolution Of Education Expenditures •Economic Effects •Social Effects

	Adrian Măcriș, M. Măcriș		outcomes and increased access to education[5].	
6	Composition of Government Expenditures and Demand for Education in Developing Countries Era Dabla-Norris, J. Matovu	Reducing household costs of primary education has the largest positive impact on growth and poverty reduction in the short run.	• An increase in higher education spending increases long-run growth. • Increasing education spending can have substantial effects on growth and poverty reduction, even when it comes at the expense of public infrastructure investment[6].	•Human Capital Accumulation •Economic Growth •Poverty Reduction
7	Composition of Government Expenditures and Demand for Education in Developing Countries 8Era Dabla-Norris, John M9. Matovu	Reducing household costs of primary education has the largest positive impact on growth and poverty reduction in the short run.	• Reducing household costs of primary education has the largest positive impact on growth and poverty reduction in the short run. • An increase in higher education spending increases long-run growth. • Increasing education spending can have substantial effects on growth and poverty reduction[7].	•Human Capital Accumulation •Economic Growth •Poverty Reduction
8	Macroeconomic Effects of Public Education Expenditure K. Angelopoulos, J. Malley, A. Philippopoulos	Increases in public education spending raise growth.	• Increases in public education spending can raise growth. • Increases in public education spending are not necessarily welfare promoting. • Welfare gains can be realized if increases in public education spending[8].	•Growth Effects Of Public Education Spending •Welfare Effects Of Public Education Spending
9	Public Education Expenditure, Growth and Welfare K. Angelopoulos, J. Malley, A. Philippopoulos Social Science Research Network	Public education spending is both growth and welfare promoting.	• Public spending on education is both growth and welfare promoting. • Welfare gains of up to 4% of consumption can be obtained if the composition of public spending is altered in favour of education. • Government size should be less than the growth maximising one due to crowding out of private consumption[9].	•Economic Growth •Welfare
10	Government education expenditures and economic growth: a meta-analysis S. Awaworyi Churchill, M. Ugur, Siew Ling Yew	The effect of government education expenditure on growth is positive for developed countries.	• Government expenditure on education has a positive effect on economic growth in developed countries. • Government expenditure on education has an insignificant effect on economic growth in less developed countries[10].	•Economic Growth
11	Impact of government expenditure on education: The Nigerian experience Z. Obi, C. Obi 2014 20 Citations	The educational sector has not been productive as expected.	• Poor quality of graduates, increasing cases of cultism in schools and high rates of drop-outs indicate that the educational sector has not been productive as expected of educational capital[11].	•Economic Growth •Gross Domestic Product (Gdp)
12	Understanding the dynamic effects of government spending on foreign trade Gernot J. Müller 2008 81 Citations	Increased government spending significantly depreciates the nominal exchange rate, appreciates the terms of trade	• An increase in government spending significantly depreciates the nominal exchange rate, appreciates the terms of trade and increases net exports. • A New Keynesian general equilibrium model is shown to match qualitatively the response of relative prices to the same spending shock[12].	•Nominal Exchange Rate •Terms Of Trade •Net Exports
13	Nexus between Government Expenditure on Education and Economic Growth:	Economic growth affects the level of government spending on	• Government spending on education has a positive effect on economic growth in India. • Economic growth affects the level of government spending on education. •	•Economic Growth

	Empirical Evidences from India Abhijeet Chandra	education irrespective of any lag effects.	Investments in education also tend to influence economic growth with time-lag[13].	
14	Public Education Expenditures, Taxation, and Growth: Linking Data to Theory William F. Blankenau, N. Simpson, M. Tomljanovich	The growth effects of expenditures are ambiguous in nearly every model where growth is fueled by public education expenditures.	• Economic theory suggests that public education expenditures can have a positive effect on economic growth, but empirical evidence is mixed. • relationship between public education expenditures, taxation, and growth, and finds that accounting for the method of finance is essential to understanding the growth effects of expenditures[14].	•Economic Growth
15	Analysis of Effects of Government Education Expenditure and School Attainment on Per Capita Income in Nigeria O. Kenneth, O. Kenneth, R. Uju, U. Chris 2020	The Nigerian government should revise the current education curriculum so as to produce self-employable graduates.	• Gross fixed capital formation, government capital expenditure on education, secondary school enrolment ratio, tertiary school enrolment ratio and adult literacy rate had significantly positive effects on GDP per capita[15].	•Per Capita Gross Domestic Product
16	The Effect of Education Expenditure on Per Capita GDP in Developing Countries E. Appiah 2017	Expanding education expenditure in developing countries affects per per capita GDP positively.	• Expansion in education expenditure in developing countries affects per capita GDP positively. • The effect of increased spending on education on per capita GDP is not different from that of Sub-Saharan African (SSA) countries[16].	•Per Capita Gdp
17	Government education expenditure and primary school enrolment in Nigeria: An impact analysis O. A. Ihugba, Joseph C. Ukwunna, Sandralyn Obiukwu	Government policies directed at education expenditure should be largely increased.	• Government education expenditure has an insignificant relationship with primary school enrolment. • Remittances have a positive relationship with primary school enrolment. • Population growth has a positive relationship in the short run, but a negative relationship in the long run[17].	•Primary School Enrolment
18	Does public education expenditure cause economic growth? Comparison of developed and developing countries Alvina Sabah Idrees, M. W. Siddiqi	The impact of public education expenditures on economic growth is greater in the case of developing countries as compare to the developed countries.	• Public education expenditure has a positive effect on economic growth. • The impact of public education expenditure on economic growth is greater in developing countries than in developed countries. • The results of the study support the "catching-up effect" in developing countries[18].	•Economic Growth
19	Education Expenditure-Led Growth: Evidence from Nigeria (1980-2018) O. Lawanson, D. I. Umar International Business Research 2020	The funding of primary education should be supported by the federal government as weak primary school funding will impact on quality of pupils	• Total government education expenditures, primary, secondary and tertiary education expenditure have a positive and statistically significant impact on economic growth (except primary education expenditure which is not significant). • There is bi-directional causality between all levels of public expenditure on education and economic growth[19].	•Economic Growth
20	Empirical Evaluation of the Education Expenditure Impact on Economic Growth Olena Vorhach	Increased funding for higher education contributes to the growth of the share of highly qualified	• Average figures in 24 foreign countries did not reveal a pronounced dependence of the population qualification on expenditure on higher education and that of GDP on qualification. Higher GDP in	•Share Of Highly Qualified Employed Population Of Ukraine •Population Qualification Level

	2020	population and the GDP volume per capita in Ukraine.	countries with heavier expenditure on higher education[20].	In Foreign Countries •GDP Volume Per Capita In Foreign Countries
21	Does Government Spending on Education Promote Growth and Schooling Returns? P. Basu, K. Bhattarai 2010 8 Citations	Public spending on education tends to depress schooling return.	• Cross-country data shows little positive correlation between growth and public spending on education. • Public spending on education tends to depress schooling return. • An endogenous growth model shows the explicit linkage between government intervention and growth via schooling return[21].	•Growth •Public Spending On Education •Schooling Return
22	The Impact of Government Expenditures on Imports within the Euro Area M. Mulder 2014	Only government expenditures and private consumption have a significant effect.	• Government expenditures and private consumption have a significant effect on imports from the four peripheral countries. • The results should be interpreted carefully due to evidence of misspecification. • Private investments do not have a significant effect on imports from the four peripheral countries[22].	•Volume Of Imports Originating From The 4 Peripheral Countries (Spain, Greece, Ireland, And Portugal)
23	An Empirical Note on Government Expenditure and Imports: an ARDL Cointegration Investigation Constantinos Alexiou 2010	The direct effect of changes in government expenditure on import demand is valuable insights into the relationship between government expenditures and imports.	• An ARDL cointegration approach was applied to a dataset spanning the Greek economy from 1970 to 2007, providing valuable insights into the direct effect of changes in government expenditure on import demand. • The results suggest that an increase in government expenditure leads to an increase in imports. • The results also suggest that the relationship between government expenditure and imports is stable over time[23].	•Import Demand
24	Causal Relationship between Nigeria Government Budget Allocation to the Education Sector and Economic Growth U. Ejiogu, O. A. Ihugba,	The government should increase its budget allocation to the sector.	• Expenditure on education is positively related to GDP. • GDP granger causes expenditure on education. • Education funding under civilian rule was higher than education funding under military rule[24].	•Gross Domestic Product (Gdp) •Expenditure On Education •Gross Fixed Capital Formation
25	Does Government Expenditure in Education Cause Economic Growth: ASEAN-5 Perspective S. Taasim	Education expenditure is listed as a government public expenditure with the highest accumulation in yearly budget for	• Fixed effects model showed no relation between education expenditure and economic growth in ASEAN-5. • Labour force and capital accumulation were important variables influencing economic growth[25].	•Economic Growth
26	An Analysis of Determinants of India's Import: Panel Regression Approach M. Sinha 2016	The main determinants of Indian import are resource and openness.	• The overall growth rate of Indian import is 3.6 percent during more than last two decades. • Resource is the most important development variable, with an elasticity of almost equal to one and statistically significant[26].	•India'S Import
27	Public Sector Education Investment and Manufacturing Output in Nigeria: Empirics and Policy Options	Public education spending has a positive but insignificant effect on manufacturing	• Primary school enrolment rate, per capita income, exchange rate, and foreign direct investment have a significant effect on manufacturing output growth in Nigeria. • Government should target	•Manufacturing Output Growth

	Chukwunonso S. Ekesiobi, S. K. Dimnwobi, Ogonna E. Ifebi, Bruno N. Ibekilo	output growth in Nigeria.	education spending in ways that favour manufacturing industry growth[27].	
28	Education Imports and Exports in the Framework of the World Trade Organization and Adjustments of Education Legislation and Policy Making in China Zhou Man-sheng	The Chinese government's efforts to adjust education legislation and policy making are examined in the paper.	• China has made commitments on trade in education services as part of its WTO membership. • This paper provides an analysis of the forms of educational imports and exports in the framework of WTO. • The Chinese government has adjusted education legislation and policy making to accommodate WTO commitments[28].	•Forms Of Educational Imports •Forms Of Educational Exports •Efforts Of The Chinese Government To Adjust Education Legislation

2. Methods

In this research it has been used secondary source data from World Bank in cross sectional format. For a sampling we used 185 countries fom the econoimc development ranking for the 2022. Intially we used correlation matrix test of Pearson, checked data normalty test. Total observation estimated in OLS, Robust, natural logarithm and marginal effects. For generalizng current 4 model estimated stire in one model. Case processing summary proceed in SPSS 22.0 software for calculating selected countries from expenditures and import shares prospective. While countrie's estimated distance between final cluster centers and large scale cluster analysis of the world countries.

3. Results

Government spending on education is an order of magnitude higher than private spending, and their share in budget spending is large. Even higher education is provided mainly by the state. For example, in Anglo-Saxon countries, the share of private spending on it does not exceed a third, and the primary school is almost completely financed from the budget. Investments in the state industry lead to the introduction of new technologies, increased labor productivity, higher wages for educated workers and, along the chain, to an increase in demand in the consumer market, expansion of production and employment.

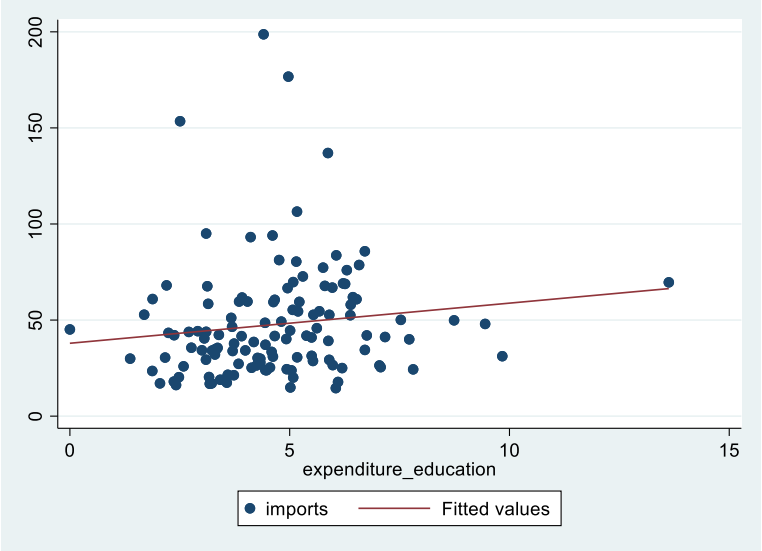

Figure 1. Scattor plot line graph

According to the theory of endogenous growth, the formation and accumulation of human capital allow for a more efficient use of physical capital, which should lead to an increase in GDP per capita. In addition, a high level of education means a more responsible attitude to one's health, a decrease in crime and greater tolerance. In turn, this contributes to reducing the cost of combating crime and health care and, in general, increasing the attractiveness of the country. While import in USD spread in line there is visualized we can say data is not really distributed (Figure 2).

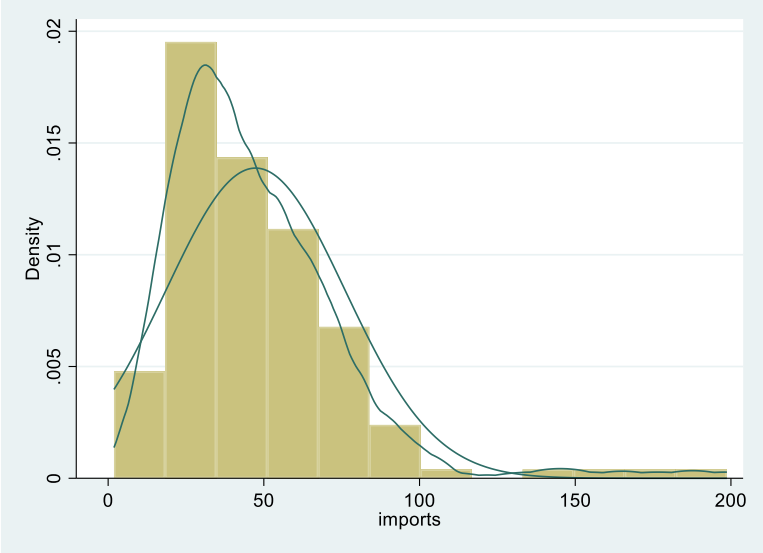

Figure 2. Normal distribution histogram plot

The table 2 shows the pairwise correlations between six variables. The correlation coefficient is displayed in each cell, with the corresponding p-value in parentheses. Variable expenditure on education and has a correlation coefficient of 0.130 with imports. Variable (3) represents exports and has a correlation coefficient of 0.840 with imports. The next approach that tested Shapiro-Wilk W test for normal data of the yhat and ehat.

Table 2. Pearson pairwise correlations matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) imports	1.000					
(2) expenditure_ed~n	0.130	1.000				
	(0.148)					
(3) exports	0.840*	0.078	1.000			
	(0.000)	(0.384)				
(4) IMF_credit	-0.371*	-0.054	-0.153	1.000		
	(0.000)	(0.638)	(0.150)			
(5) access_electri~y	0.210*	0.243*	0.278*	0.227*	1.000	
	(0.009)	(0.004)	(0.001)	(0.023)		
(6) credit_private~r	0.248*	0.193*	0.290*	0.316*	0.418*	1.000
	(0.005)	(0.043)	(0.001)	(0.004)	(0.000)	

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

While IMF credit and has a correlation coefficient of -0.371 with imports and, access to electricity and has a correlation coefficient of 0.210 with imports. But Variable (6) represents private credit and has a correlation coefficient of 0.248 with imports.

Table 2. OLS regression outcomes

imports	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
expenditure_educat~n	1.64	.936	1.75	.085	-.233	3.513	*
exports	.471	.075	6.27	0	.321	.622	***
IMF_credit	0	0	-4.56	0	0	0	***
access_electricity	-.009	.058	-0.16	.873	-.126	.107	
credit_private_sec~r	.128	.041	3.14	.003	.046	.209	***
Constant	16.627	5.071	3.28	.002	6.479	26.774	***

Mean dependent var	40.752	SD dependent var	16.857
R-squared	0.636	Number of obs	165
F-test	20.659	Prob > F	0.000
Akaike crit. (AIC)	494.900	Bayesian crit. (BIC)	505.772

*** $p<.01$, ** $p<.05$, * $p<.1$

Based on the given table 2, the linear regression results suggest that imports (the dependent variable) are significantly influenced by several independent variables. The coefficient for expenditure on education is 1.64, with a standard error of 0.936. The t-value is 1.75, and the p-value is 0.085, which means that the correlation between imports and expenditure on education is marginally significant at the 0.1 level (*). The coefficient for exports is 0.471, with a standard error of 0.075. The t-value is 6.27, and the p-value is 0, indicating a highly significant correlation between imports and exports (***). The coefficient for IMF credit is 0, with a standard error of 0. The t-value is -4.56, and the p-value is 0, suggesting a highly significant negative correlation between imports and IMF credit (***). The coefficient for access to electricity is -0.009, with a standard error of 0.058. The t-value is -0.16, and the p-value is 0.873, indicating that the correlation between imports and access to electricity is not significant.

The coefficient for private credit is 0.128, with a standard error of 0.041. The t-value is 3.14, and the p-value is 0.003, demonstrating a highly significant positive correlation between imports and private credit (***). Lastly, the constant term in the regression equation is 16.627, with a standard error of 5.071. The t-value is 3.28, and the p-value is 0.002, suggesting that the constant term is significant in explaining imports (***). The R-squared value of 0.636 indicates that the independent variables explain approximately 63.6% of the variance in imports. The F-test with a value of 20.659 and a p-value of 0.000 suggests that the overall regression model is highly significant. The Akaike criterion (AIC) value of 494.900 and the Bayesian criterion (BIC) value of 505.772 provide information about the relative goodness-of-fit of the model, with lower values indicating better fit.

Based on the given information, the linear regression results suggest that imports are significantly influenced by several independent variables. The coefficient of 1.64 suggests that for every unit increase in expenditure on education, imports are expected to increase by 1.64 units. The t-value of 1.75 and p-value of 0.085 indicate that the correlation between imports and expenditure on education is marginally significant at the 0.1 level. The coefficient of 0.471 suggests that for every unit increase in exports, imports are expected to increase by 0.471 units.

The t-value of 6.27 and p-value of 0 indicate a highly significant correlation between imports and exports. The coefficient of 0 suggests that there is no linear relationship between IMF credit and imports. The t-value of -4.56 and p-value of 0 indicate a highly significant negative correlation between imports and IMF credit.

Table 3. OLS robust regression results

imports	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
expenditure_educat~n	1.64	1.097	1.49	.14	-.555	3.835	
exports	.471	.082	5.76	0	.307	.635	***
IMF_credit	0	0	-6.33	0	0	0	***
access_electricity	-.009	.064	-0.15	.884	-.137	.118	
credit_private_sec~r	.128	.034	3.73	0	.059	.196	***
Constant	16.627	4.352	3.82	0	7.919	25.334	***

Mean dependent var	40.752	SD dependent var	16.857
R-squared	0.636	Number of obs	165
F-test	.	Prob > F	.
Akaike crit. (AIC)	494.900	Bayesian crit. (BIC)	505.772

*** $p<.01$, ** $p<.05$, * $p<.1$

Coefficient of -0.009 suggests that for every unit increase in access to electricity, imports are expected to decrease by 0.009 units. However, the t-value of -0.16 and p-value of 0.873 indicate that the correlation between imports and access to electricity is not significant. for every unit increase in private credit, imports are expected to increase by 0.128 units. The t-value of 3.14 and p-value of 0.003 demonstrate a highly significant positive correlation between imports and private credit. The constant term in the regression equation (16.627) is also significant in explaining imports, with a t-value of 3.28 and p-value of 0.002.

Table 4. Conditional marginal effects regression results

Conditional marginal effects Number of obs = 165
Model VCE: Robust
Expression: Linear prediction, predict()
dy/dx wrt: expenditure_education exports IMF_credit access_electricity credit_private_sector
At: expenditure_education = 4.328093 (mean)
exports = 31.88393 (mean)
access_electricity = 81.21194 (mean)
credit_private_sector = 48.46087 (mean)

Delta-method

	dy/dx	std.err.	t	P>t	[95% conf.	interval]
expenditure_education	1.640	1.097	1.490	0.140	-0.555	3.835
exports	0.471	0.082	5.760	0.000	0.307	0.635
IMF_credit	-0.000	0.000	-6.330	0.000	-0.000	-0.000
access_electricity	-0.009	0.064	-0.150	0.884	-0.137	0.118
credit_private_sector	0.128	0.034	3.730	0.000	0.059	0.196

For every unit increase in expenditure on education, imports are expected to increase by 1.64 units. However, the t-value of 1.75 and p-value of 0.085 indicate that the correlation between imports and expenditure on education is only marginally significant at the 0.1 level. Menatime for every unit increase in exports, imports are expected to increase by 0.471 units. The t-value

of 6.27 and p-value of 0 indicate a highly significant correlation between imports and exports. However, the t-value of -4.56 and p-value of 0 indicate a highly significant negative correlation between imports and IMF credit. for every unit increase in access to electricity, imports are expected to decrease by 0.009 units. However, the t-value of -0.16 and p-value of 0.873 indicate that the correlation between imports and access to electricity is not significant. The t-value of 3.14 and p-value of 0.003 demonstrate a highly significant positive correlation between imports and private credit.

Table 5. Linear Regression Models with Logarithmic Transformations

lnimports	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
expenditure_educat~n	.049	.024	2.07	.043	.002	.096	**
exports	.01	.002	5.26	0	.006	.014	***
IMF_credit	0	0	-5.50	0	0	0	***
access_electricity	0	.001	-0.06	.951	-.003	.003	
credit_private_sec~r	.003	.001	3.05	.003	.001	.005	***
Constant	3.051	.128	23.82	0	2.795	3.308	***

Mean dependent var	3.622	SD dependent var	0.422
R-squared	0.630	Number of obs	165
F-test	20.059	Prob > F	0.000
Akaike crit. (AIC)	16.691	Bayesian crit. (BIC)	27.563

*** p<.01, ** p<.05, * p<.1

In this case we can interpretae current estimations as followings: For every unit increase in expenditure on education, imports are expected to increase by 0.049 units. The t-value of 2.07 and p-value of 0.043 indicate that the correlation between imports and expenditure on education is marginally significant at the 0.05 level. For every unit increase in exports, imports are expected to increase by 0.01 units. The t-value of 5.26 and p-value of 0 indicate a highly significant correlation between imports and exports. However, the t-value of -5.50 and p-value of 0 indicate a highly significant negative correlation between imports and IMF credit.

Table 6. Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
yhat	65	0.988	0.700	-0.772	0.780
ehat	65	0.988	0.697	-0.782	0.783

The Shapiro-Wilk W test for normality is used to determine if a dataset follows a normal distribution. In this case, the test is applied to the residuals of the regression model, which are denoted as "ehat". The null hypothesis is that the residuals are normally distributed. The test statistic W is 0.988, and the associated p-value is 0.783. Since the p-value is greater than 0.05, we fail to reject the null hypothesis. This suggests that the residuals of the regression model are normally distributed, indicating that the assumptions of linear regression are met. Therefore, we can conclude that the linear regression results are valid and reliable in explaining the relationship between the independent variables and imports.

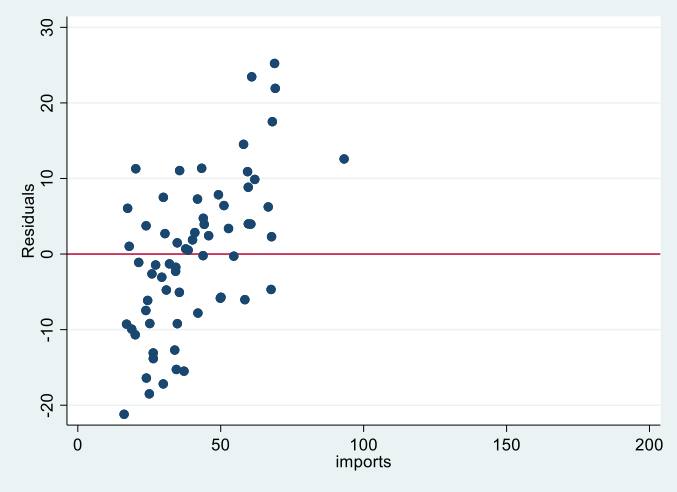

Figure 3. Normal distribution scatter plot

Based on the Breusch-Pagan/Cook-Weisberg test for heteroskedasticity, the null hypothesis is that there is constant variance in the error terms. The test statistic chi2 is 0.62, and the associated p-value is 0.432. Since the p-value is greater than 0.05, we fail to reject the null hypothesis.

Table 7. Overall model estimations

Variable	OLS	Robust	Margins	ln
expenditur~n	1.640	0.049	0.049	0.049*
exports	0.471***	0.010***	0.010***	0.010***
IMF_credit	-0.000***	-0.000***	-0.000***	-0.000***
access_ele~y	-0.009	0.000	0.000	0.000
credit_pri~r	0.128**	0.003***	0.003***	0.003**
cons	16.627**	3.051***	3.051***	3.051***
N	165	165	165	165
R2	0.636	0.630	0.630	0.630
R2_adjust	0.606	0.598	0.598	0.598
RMSE	10.585	0.267	0.267	0.267

Legend: * p<.05; ** p<.01; *** p<.001

This suggests that there is no evidence of heteroskedasticity in the regression model, indicating that the assumption of constant variance in the error terms is met. Therefore, we can conclude that the linear regression results are valid and reliable in explaining the relationship between the independent variables and imports, and there is no evidence of heteroskedasticity.

Table 8. Case Processing Summary

Cases							
Valid		Rejected				Total	
		Missing Value		Negative Value			
N	Percent	N	Percent	N	Percent	N	Percent
138	75.0%	46	25.0%	0	0.0%	184	100.0%
Cluster	1	4.000	**Number of Cases in each Cluster**				

	2	62.000	
	3	72.000	

a. Rescaled Reversed Absolute Chi-square between Sets of Frequencies used

The case processing summary indicates that there were 184 cases included in the regression analysis. Out of these cases, 138 (75.0%) had valid values for all variables, while 46 (25.0%) were rejected due to missing or negative values. The data was also clustered into three groups, with Cluster 1 having 4 cases, Cluster 2 having 62 cases, and Cluster 3 having 72 cases. The rescaled reversed absolute chi-square statistic was used to compare the frequencies between the clusters. Overall, this summary provides information on the number of cases included in the analysis and the quality of the data used.

Table 9. Distances between Final Cluster Centers

Cluster	1	2	3
1		7.294	4.769
2	7.294		2.525
3	4.769	2.525	

The distances between the final cluster centers are as follows: The distance between Cluster 1 and Cluster 2 is 7.294. The distance between Cluster 1 and Cluster 3 is 4.769. The distance between Cluster 2 and Cluster 3 is 2.525.

Table 10. Final Cluster Centers

	Cluster		
	1	2	3
expenditure_education	10.412339687347	3.118463227205	5.643122388257

Based on the provided table, there is a cluster effect among countries based on their assigned clusters and the distances between them. The clusters are represented by numbers, and the distance is denoted by a decimal value. The cluster effect suggests that countries within the same cluster have similar distances between them according to the measure used. Countries that share the same cluster are likely to have closer proximity or similarities based on the specific criteria used to calculate the distances.

For example, countries like Afghanistan, Angola, Albania, and Armenia belong to Cluster 2. This indicates that these countries have relatively similar distances between them. On the other hand, countries like Argentina, Australia, Austria, and Belgium belong to Cluster 3, suggesting that these countries have comparable distances among themselves.

It's important to note that without additional information about the specific measure of distance and the methodology used to determine the clusters, it is challenging to provide a comprehensive analysis of the cluster effect among countries in this context.

Table 11. Large scale cluster analysis of the world countries.

№	Country	Cluster	Distance	№	Country	Cluster	Distance
1	Aruba	.	.	37	Colombia	3	.710
2	Afghanistan	2	.258	38	Comoros	.	.
3	Angola	2	.703	39	Costa_Rica	3	1.068
4	Albania	2	.018	40	Cuba	2	3.118
5	Andorra	.	.	41	Curacao	3	1.786
6	UAE	2	.761	42	Cayman_Islands	.	.
7	Argentina	3	.627	43	Cyprus	3	.417
8	Armenia	2	.413	44	Czechia	3	.563
9	Australia	3	.457	45	Germany	3	.983
10	Austria	3	.573	46	Djibouti	.	.
11	Azerbaijan	2	1.214	47	Dominica	3	.947
12	Burundi	3	.602	48	Denmark	3	.737
13	Belgium	3	1.067	49	Dominican_Republic	3	1.024
14	Benin	2	.115	50	Algeria	3	1.399
15	Burkina_Faso	3	.124	51	Ecuador	2	1.016
16	Bangladesh	2	1.069	52	Egypt	2	.638
17	Bulgaria	2	.922	53	Eritrea	.	.
18	Bahrain	2	.966	54	Spain	3	1.053
19	Bahamas	2	.747	55	Estonia	3	.937
20	Bosnia_H	.	.	56	Ethiopia	.	.
21	Belarus	3	.691	57	Finland	3	.237
22	Belize	3	1.886	58	Fiji	3	.032
23	Bermuda	2	1.244	59	France	3	.143
24	Bolivia	1	.575	60	Micronesia	.	.
25	Brazil	.	.	61	Gabon	2	.063
26	Barbados	2	.060	62	UK	3	.113
27	Brunei	.	.	63	Georgia	2	.732
28	Bhutan	3	.258	64	Ghana	.	.
29	Botswana	1	1.672	65	Gibraltar	.	.
30	Central_Africa	2	.952	66	Guinea	2	.919
31	Canada	3	.473	67	Gambia	2	.355
32	Switzerland	3	.423	68	Equatorial_Guinea	.	.
33	Chile	.	.	69	Greece	3	1.203
34	China	2	.452	70	Grenada	.	.
35	Cameroon	2	.048	71	Greenland	.	.

36	Congo	3	1.195	72	Guatemala	2	.181

№	Country	Cluster	Distance	№	Country	Cluster	Distance
73	Guam	.	.	109	Moldova	3	.746
74	Guyana	.	.	110	Madagascar	2	.023
75	Hong_Kong	3	1.237	111	Maldives	3	.157
76	Honduras	3	.795	112	Mexico	.	.
77	Croatia	3	.103	113	Marshall_Islands	1	3.213
78	Haiti	2	1.747	114	Malta	3	.227
79	Hungary	3	.883	115	Myanmar	.	.
80	Indonesia	2	.372	116	Montenegro	.	.
81	India	3	1.169	117	Mongolia	3	.983
82	Ireland	2	.018	118	Mozambique	3	.617
83	Iran	2	.474	119	Mauritania	2	1.237
84	Iraq	.	.	120	Malaysia	2	.799
85	Iceland	3	2.077	121	Namibia	1	.965
86	Israel	3	1.427	122	Niger	2	.719
87	Italy	2	1.152	123	Nigeria	.	.
88	Jamaica	3	.026	124	Nicaragua	3	1.013
89	Jordan	2	.552	125	Netherlands	3	.343
90	Japan	2	.302	126	Norway	3	.257
91	Kazakhstan	3	1.197	127	Nepal	2	1.065
92	Kenya	3	.563	128	Nauru	3	.476
93	Kyrgyzistan	3	.572	129	New_Zealand	3	.337
94	Cambodia	2	.008	130	Oman	.	.
95	Kiribati	.	.	131	Pakistan	2	.753
96	Korea	.	.	132	Panama	2	.788
97	Kuwait	3	.908	133	Peru	2	1.128
98	Lebanon	2	1.428	134	Philippines	2	.616
99	Liberia	2	.809	135	Palau	.	.
100	Libya	.	.	136	Poland	3	.453
101	Liechtenstein	.	.	137	Puerto_Rico	2	.271
102	Sri_Lanka	.	.	138	Korea_Democratic	.	.
103	Lithuania	.	.	139	Portugal	3	.633
104	Luxembourg	3	.673	140	Paraguay	2	.185
105	Latvia	3	.327	141	Qatar	2	.115
106	Macao	3	.657	142	Romania	2	.572
107	Morocco	3	1.111	143	RF	2	.612

108	Monaco	.	.	144	Rwanda	2	.212

№	Country	Cluster	Distance	№	Country	Cluster	Distance
144	Rwanda	2	.212	165	Turkiye	2	.242
145	Saudi_Arabia	3	2.166	166	Tuvalu	.	.
146	Sudan	.	.	167	Tanzania	2	.107
147	Senegal	3	.145	168	Uganda	2	.532
148	Singapore	2	.612	169	Ukraine	3	.261
149	Somalia	.	.	170	Uruguay	3	1.091
150	Serbia	.	.	171	US	3	.407
151	Suriname	3	.636	172	Uzbekistan	3	.720
152	Slovakia	3	1.033	173	Venezuela	.	.
153	Slovenia	3	.117	174	Virgin_Islands_UK	2	.528
154	Sweden	3	1.527	175	Virgin_Islands_US	.	.
155	Seychelles	3	.492	176	Vietnam	2	.993
156	Syrian	.	.	177	Vanuatu	2	.876
157	Chad	2	.210	178	World	2	1.214
158	Togo	2	.873	179	Samoa	3	.834
159	Thailand	2	.027	180	Kosovo	.	.
160	Tajikistan	3	.274	181	Yemen	.	.
161	Turkmenistan	.	.	182	South_Africa	3	.550
162	Tonga	3	.877	183	Zambia	2	.584
163	Trinidad_Tobago	2	.985	184	Zimbabwe		

The next cluster effect implies that countries within the same cluster tend to share certain characteristics or exhibit similarities based on the calculated distances. Conversely, countries in different clusters are likely to have greater dissimilarities according to the distance measure. For example, countries like Aruba, Andorra, and Brunei do not have a specified cluster assigned to them, which suggests they may be outliers or have distinct characteristics that set them apart from the other countries.

Discussion

The results for developed and developing countries are different. In developed countries, an increase in spending on all types of education leads to economic growth, and the return on secondary and tertiary education is higher. For developing countries, rising spending on primary and secondary education has a greater effect. At the same time, the short-term economic effect of an increase in public spending on education for developing countries is small, it is most noticeable, again, with an increase in funding for primary and secondary education. Current analysisexplains enrollment of children in primary and then secondary education has a positive effect on GDP. But the rapid growth of the economy may not necessarily be the result of increased spending on education. In particular, Ethiopia's annual

GDP growth of 8-10% is provided by the oil production that has begun. The similar growth of the Libyan economy in 2018-2019 is explained by a slow start.

It is worth noting that the specific distance metric used to calculate the distances between countries is not provided. Therefore, we cannot determine the exact nature of the similarity or dissimilarity captured by the clusters. Additionally, without information about the methodology used for clustering, it is challenging to provide a comprehensive interpretation of the cluster effect. Overall, the cluster effect among countries, as depicted in the provided table, indicates the presence of some patterns or similarities in terms of the calculated distances.

Higher education in the EU is financed by 79.9% from public spending (which also includes spending on school education, health care, social security, public transport, etc.), 5.4% comes from non-profit organizations and firms and 11.5% of the funds is paid as tuition fees. The structure of the budgets of higher education institutions is very different, but the share of state subsidies is high in all countries. In Denmark, Greece, Portugal and Finland, the share of budget appropriations covers more than 90% of the total costs of universities, colleges and polytechnics. In Bulgaria, Cyprus, Latvia and Poland, it is noticeably lower, more than 30% of the costs of universities are covered by tuition fees. Business corporations and charitable organizations, as a rule, rarely transfer money directly to the budgets of universities, but in Hungary, the Netherlands, Sweden and the UK, their contributions make up 11-16% of the budgets of higher education institutions. Foreign sources play an important role in funding universities and colleges in Greece, Latvia, Lithuania and especially Malta.

The share of spending on higher education in public spending in almost all EU countries ranges between 2 and 3%. It is less than 2% only in the Czech Republic (1.98%), Italy (I, 61%) and Malta (1.7%). In the Scandinavian countries, on the contrary, it is relatively high and amounts to 3.7-4.5%, Denmark is the leader here. In Norway, which cooperates with the EU in the field of education, this figure reaches 4.78%. It is influenced by the demographic composition of the population, the number of students and doctoral students, the salary level of those who work in educational institutions, as well as the structure of appropriations for this branch of education. For example, in both Denmark and Norway, about a third of the allocated funds go to grants and educational loans for students and doctoral students.

Conclusion

Based on the various analysis we can come conclusion as followings. There are few hypotheses tested in accordance with F-test and t-test for linear regression model (OLS, OLS Robust), but marginal effect ang lin-log model we have tested another hypothesis. Analysis found as statistically significant level in $p>0.05$ level (Ceteris Paribus). Countries members of the European Union, clustered in 1, the cost of studying one student / doctoral student as a whole correlate with such an indicator of national well-being as average per capita GDP. Thus, for higher education2 in Latvia, Lithuania, Bulgaria, Poland, Slovakia, with a low GDP per capita, relatively few funds are spent annually. However, there is no rigid dependence here: in other countries with approximately the same level of GDP per capita (Great Britain and Sweden, Italy and Finland), public funding of higher education can vary greatly.

On the other hand, countries like Afghanistan, Angola, and Albania are grouped together in Cluster 2, indicating they have relatively closer distances or similarities according to the

employed measure. Similarly, countries like Argentina, Australia, and Austria form Cluster 3, suggesting they have comparable distances among themselves.

The coefficient of 0.003 suggests that for every unit increase in private credit in logarithm trasnformation model, imports are expected to increase by 0.003 units. The t-value of 3.05 and p-value of 0.003 demonstrate a highly significant positive correlation between imports and private credit. he constant term in the regression equation (3.051) is also significant in explaining imports, with a t-value of 23.82 and p-value of 0.00.

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