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# MEHNAT IQTISODIYOTI VA INSON KAPITALI 2023

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## THE IMPACT OF HEALTH AND EDUCATION EXPENDITURE ON ECONOMIC GROWTH IN CASE OF UZBEKISTAN

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**Abstract.** Uzbekistan is acknowledged as one of the fast-developing nations in terms of both social and economic scales among Central Asian countries for last five years. Thus, majority of politicians and scholars have claimed the role of education and health care growth in this progress and by taking into account those factors, this study aims to examine the impact of allocating budget on education and health care on economic growth of Uzbekistan since reaching independent. The ARDL bounds test has been employed to assess the relationship between selected variables and economic growth in both the short and long terms. In addition to this, except variables about the expenditure on education and health care, some other controlling variables are also included into the model. Based on the outcome of the test, expenditure on education has positive influence on economic growth while that of presented negative integration with economic growth in case of making an investment on health care in case of Uzbekistan under the focused model examination as presented in the further parts below.

**Keywords.** Uzbekistan, Expenditure on Education/Health care, ARDL, long run and short run.

## O'ZBEKISTON MISOLIDA SOG'LIQNI SAQLASH VA TA'LIM XARAJATLARINING IQTISODIY O'SISHGA TA'SIRI

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**Annotatsiya.** O'zbekiston keyingi besh yil ichida Markaziy Osiyo davlatlari orasida ham ijtimoiy, ham iqtisodiy ko'lami bo'yicha jadal rivojlanayotgan davlatlardan biri sifatida e'tirof etildi. Shunday qilib, ko'pchilik siyosatchilar va olimlar ushbu taraqqiyotda ta'lim va sog'liqni saqlash o'sishining o'rni borligini ta'kidlaydilar va ushbu omillarni hisobga olgan holda, ushbu tadqiqot O'zbekiston mustaqillikka erishgandan so'ng ta'lim va sog'liqni saqlash budjetlaridan ajratilgan mablag'larning ta'sirini o'rganishga qaratilgan. ARDL chegaralari testi tanlangan o'zgaruvchilar hamda qisqa muddatli va uzoq muddatli iqtisodiy o'sish o'rtasidagi munosabatlarni baholash uchun ishlatilgan. Bundan tashqari, ta'lim va sog'liqni saqlash xarajatlari bo'yicha o'zgaruvchilardan tashqari, ba'zi boshqa nazorat o'zgaruvchilari ham modelga kiritilgan. Test natijalariga ko'ra, ta'lim xarajatlari iqtisodiy o'sishga ijobiy ta'sir ko'rsatadi, ta'lim xarajatlari esa iqtisodiy o'sish bilan integratsiyaga salbiy ta'sir ko'rsatadi.

**Kalit so'zlar.** O'zbekiston, ta'lim/sog'liqni saqlash xarajatlari, ARDL, uzoq muddatli va qisqa muddatli davr.

## ВЛИЯНИЕ РАСХОДОВ НА ЗДРАВООХРАНЕНИЕ И ОБРАЗОВАНИЕ НА ЭКОНОМИЧЕСКИЙ РОСТ НА ПРИМЕРЕ УЗБЕКИСТАНА

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**Аннотация.** Узбекистан за последние пять лет признан одним из быстроразвивающихся государств как по социальному, так и по экономическому масштабу среди стран Центральной Азии. Таким образом, большинство политиков и ученых заявляют о роли роста образования и здравоохранения в этом прогрессе, и, принимая во внимание эти факторы, данное исследование направлено на изучение влияния распределения бюджета на образование и здравоохранение на экономический рост Узбекистана с момента достижения независимый. Тест границ ARDL использовался для оценки взаимосвязи между выбранными переменными и экономическим ростом как в краткосрочной, так и в долгосрочной перспективе. Помимо этого, кроме переменных о расходах на образование и здравоохранение, в модель включены и некоторые другие управляющие переменные. Согласно результатам теста, расходы на образование оказывают положительное влияние на экономический рост, в то время как расходы на образование оказывают отрицательное влияние на интеграцию с экономическим ростом в случае инвестиций в здравоохранение в случае Узбекистана в рамках целенаправленного модельного исследования, как представлено в дальнейших частях ниже.

**Ключевые слова.** Узбекистан, расходы на образование/здравоохранение, ARDL, долгосрочный и краткосрочный период

### Introduction:

Individuals frequently spend more on healthcare services and products when affluence levels rise in a nation in order to improve their quality of life, but it has only been recently and actively brought into the mainstream of economic study. A major component of improving human capital has been investing in education and health. The majority of nations plans for development. Individuals frequently spend more on healthcare services and products when affluence levels rise in a nation in order to improve their quality of life. The development of human capital is influenced by a number of essential elements, including health and education. a wholesome and a highly qualified generation will be capable of producing more. Consequently, the growth of human capital will be beneficial. It is helpful accelerate a nation's economic growth. According to Matsushita et al. (2006), there is broad agreement, backed both conceptually and practically, that increased human capital would promote economic growth. According to Gupta, Clements, and Tiongson (1998), public expenditure on health and education has a favorable influence on the development of human capital, which in turn helps to increase economic growth since advancing fairness and lowering poverty. This meant that spending on the health care and education industries will aid in the economic growth of a country.

Uzbekistan is also regarded as one of the leading countries in the Central Asia in terms of making enormous investment on education and health care of population so as to promoting them to become successful workforce in the future in terms of development of country. In response to the statistics, government expenditure on education has increased since 2016, to be more precise, the share of expenditure on education accounted for almost 22.52% of GDP in 2017 and this figure made up nearly 22% of GDP in the subsequent year and by coming to 2021, the average spending on education has been around 20 percent of GDP which is considered relatively high in terms of promoting the education sector in the country. In addition to the expenditure on education, Uzbekistan has paid huge attention on improvement of healthcare since 2016 and this can be found its evidence in numbers. To be more accurate, real health expenditure consisted of roughly 2.672 million USD in 2018 which has been spend on construction of new hospital along with improvement of research and development in health sphere. Regarding to the figures, the average growth in health expenditure has risen by almost 8.2% annually since 2008. By compared to the border countries, Uzbekistan is regarded as fast developing nation in terms of rising literacy rate of population and their life expectancy. There have been a number of discussions in response to the influence of expenditure of education and health on development of country by many scholars and very few studies have been conducted in case of Uzbekistan.

Numerous empirical research that looked at the connection between economic growth and health spending revealed that health spending differs amongst nations with comparable and differing growth rates. Nevertheless, typically, health care costs rise gradually as a result of rising population and economic





growth. Under this study, the influence expenditure on health and education in case of Uzbekistan is going to be examined with valid and strong arguments by implication of advanced econometric approaches.

As stated above, this study is intended to explain the main contribution of education and health expenditure on economic growth in case of Uzbekistan throughout the selected period. Thus, the major question would be, whether allocating a budget to improvement of education and health leads to rising economic growth of nations and purpose of this study is going to be enriched by dealing with the following objectives:

- To examine the influence of education expenditure on Economic development of Uzbekistan
- To examine the impact of health expenditure on Economic growth of Uzbekistan
- To evaluate the share of these factors' contribution on boost of economy by compared to other essential determinants of economy
- Compare and contrast the findings and perspectives with the findings of previous studies.

In the further paragraphs the mentioned objectives of the study are going to be explained with valid and appropriate approaches in order to contribute the widening of literature on the concerned topic area.

### Literature Review:

An increasing body of recent material that is both theoretical and practical demonstrates how health (Barro, 1991; Caselli, Esquivel, & Lefort, 1996; Mankiw, Romer, & Weil, 1992) Spending increases economic growth. Economic expansion is boosted, according to Rosen (1993) and Morand (2005) by advancements in medical research as a component of physical capital; in reality, as people's health improves, labour productivity might rise. In order to create an endogenous model for economic growth, health capital should be added as another exogenous component.

Prior studies sought to analyse the relationship between health spending and economic development through technological changes, using the Solow growth model as a foundation. Newhouse (1992) argued that technical change is a key driver of rising health expenditures. While (Gerdtham & Jönsson, 2000) promoted the significance of income in raising health spending by utilizing cross-sectional data. Additionally, a sizable amount of empirical cross-sectional investigations has looked at the connection between health spending and economic expansion. The importance of affluence in affecting health spending was highlighted by (Gerdtham, Sgaard, Andersson, & Jönsson, 1992; Kleiman, 1974; Newhouse, 1977; Parkin, McGuire, & Yule, 1987). According to (Parkin et al., 1987), consumer spending may lessen the elasticities of medical treatment.

Additionally, a number of studies have examined the connection between economic developments in technology and health expenditures. According to (Finkelstein, 2007), the expansion of healthcare costs follows its deployment. Finkelstein came to the conclusion that technological advancements are endogenous and influenced by factors like medical insurance and GDP per capita.

The impact of education on boosting economic growth is also extensively researched in the previous studies. In beginning, the idea of education was profoundly examined under the heading of human resources. In fact, this notion has been corroborated by recent studies. A cross-country study (Barro, 2003) came to the conclusion that strong economic development is predicted by stronger human resources. In a panel data estimation of 100 countries for the years 1965 to 1995, Barro (2001) discovered that growth is significantly correlated with adult males' average starting years of secondary and higher education. This is due to qualified employees would supplement technological advances, and the finding emphasises the significance of technology spillovers.

In Malaysia, Mohd Yahya et al. (2012) found a long-term link between public spending on education and economic expansion. According to Musila and Belassi (2004), spending on education has a strong beneficial influence on economic growth over the long and short terms. Omojimite (2010) identified a co-integration causal relationship between economic growth and government education spending in separate research. Unimportant short-term relationships between the variables were found in certain research, nevertheless. According to Tilak (1989), there is little correlation between public education spending and GNP per capita in Latin America and the Caribbean.



According to Akram et al. (2008), there is a considerable link between some health indicators and economic growth in concerned country. Elmi and Sadeghi (2012) discovered that there is a long-term co-integrated link between economic development and health expenditure in the emerging economies they analyzed. Whereas Olubummo et al. (2012) demonstrated the presence of a long relationship between health care expenditure and economic growth in Nigeria, research by Bukenya (2009) did not announce a long-term relationship between health care spending and economic growth (as evaluated by the gross state product) in the U.S. states other than Georgia. Although 26 Indian states' state expenditure on the health care sector and economic development were examined, Apergis and Padhi's (2013) results did not provide a conclusive answer. Further research by Reeves et al. (2013) showed that investments in health support economic growth in 25 EU nations over the long and short terms. According to Faraq et al. (2012), health spending was not particularly sensitive to or proportional to income increase.

Spending in health and education has recently considered essential societal goals due to the fact that adequate human resources improve workers' skills, efficiency, and standard of life. Furthermore, because of efficiency, human capital accumulation was a key factor of economic success, and stronger economic development allows for more human capital investment. As a consequence, economic growth and human capital accumulation are linked through education and health (Eggoh, Hilaire and Gillies, 2015).

Health is a critical component of human capital that not only boosts worker efficiency but also profitability. The health of a nation's inhabitants determines its economic progress. A strong body and mind are required for daily living responsibilities, and a healthy individual may enjoy life without relying on others. Health care spending boosts food output and illness awareness. In rich nations, improved health can stimulate economic growth by up to 40%, but higher mortality has little effect in underdeveloped countries (Arora, 2001). Similarly, no administration has consistently demonstrated economic growth, contributions to elementary education, science, training, learning-by-doing, and aptitude development (Bedir, 2016).

From the beginning of the twentieth century, education, schooling, research, invention, knowledge, and employment have been major elements of person and national development. Human resource has long been viewed as an essential component of a country's prosperity and economic growth. Education is frequently regarded as the most important factor in improving human resources development. As a result, education is critical for the social and economic growth of a country. No country can make long-term economic progress unless its workforce is educated properly (Salgur, 2013).

Yet, just a small proportion of these investigations have examined the influence of economic growth on both key components of human capital, namely education and health, in both African and industrialized nations. Our empirical approach differs from previous research in the following ways (Jude, Hilaire, and Gilles, 2015; Titus and Hans, 2015): To continue, unlike other studies that concentrate just on education and health in wealthy and developing countries, we use both education and health indicators to examine the impact of human capital on growth. For each human capital dimension, we use both inventory and expenditure metrics. Furthermore, our investigation is focused on Jude, Hilaire, and Gilles-Armand (2015).

### **Methodology:**

This research assesses, while taking other factors into consideration, the short- and long-term impacts of spending on healthcare and education on Uzbekistan's economic development. In this study, we will employ the ARDL model created by Pesaran and Shin (1998) and Pesaran et al. (2001). The ARDL model has an advantage over other methods because it may be applied in many contexts. For example, the model is suitable for studies with small sample sizes and accommodates variables with varying levels of stationarity. In this approach, it is possible to suppose that variables have different lag times. To examine the long- and short-term impacts of our variables on economic growth, we define the ARDL model as follows:



$$GDPG_t = \alpha_0 + \sum_{i=0}^n \alpha_1 i \Delta Education\_expenditure_{t-1} + \sum_{i=0}^n \alpha_2 i \Delta Health\_expenditure_{t-1} + \sum_{i=0}^n \alpha_3 i \Delta Gross\_fixed_{t-1} + \delta_1 Education\_expenditure_{t-1} \delta_2 Health\_expenditure_{t-1} + \delta_3 Gross\_fixed_{t-1} + pECT_{t-1} + e_t$$

$$GDPG_t = \alpha_0 + \sum_{i=0}^n \alpha_1 i \Delta Education\_expenditure_{t-1} + \sum_{i=0}^n \alpha_2 i \Delta Health\_expenditure_{t-1} + \sum_{i=0}^n \alpha_3 i \Delta Gross\_fixed_{t-1} + \delta_1 Education\_expenditure_{t-1} \delta_2 Health\_expenditure_{t-1} + \delta_3 Gross\_fixed_{t-1} + pECT_{t-1} + e_t$$

According to the given equation above  $\alpha_0$  is standing for providing information on intercept,  $\Delta$  provides information about the difference in the determinants while  $\alpha_1 - \alpha_3$  and  $\delta_1 - \delta_3$  are targeted for representing on coefficients in the empirical analysis. Additionally, n and p represent the coefficients of ECT and provide details regarding the error correction term through lagged values.

The analysis presented above is insufficient to demonstrate a clear long-term correlation between variables. Therefore, we intend to conduct a bound test to represent this relationship. In this regard, the alternative hypothesis is presented below, whereas the null hypothesis claims that there is no long-term relationship between the variables.

$$H_0 = \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = 0$$

*H<sub>1</sub> at least one of them is not equal to zero as follows:  $\delta_1 \neq 0$*

We will make use of the upper and lower limits of the two crucial bounds to test cointegration. If the F-statistic result exceeds the upper bounds I (1), it suggests a long-run connection exists. Conversely, when the F-statistic result is less than upper bounds I (0), it indicates no cointegration.

### Results:

As previously mentioned, this study aims to empirically examine the influence of education and health expenditure on economic growth in Uzbekistan. It is obvious that, to find all essential variables is somehow challenging process for Uzbekistan, even so there are some data sources which is targeted to collect all mentioned micro and macro indicators from them. In other words, for the purpose of collecting data for expenditure for education and health care, the world bank indicator (2020) and stat.uz along with IMF.com are going to be employed as possible as complete the data for selected independent and dependent variables throughout the period of 1992 and 2021 in case of Uzbekistan.

As stated in the (table 1) below, there is information regarding to selected variables with some statistical measurements are provided. According to this, economic growth which is generated by collecting data for GDP per capita is standing for dependent variable and based on the outcome the mean value of GDP per capita has been found as being equal to 1980 USD while the min and maximum values have been 1140 and 3327 UUSD in case of Uzbekistan throughout the period of 1991 and 2022. Additionally, the major independent variables are expenditure on education and health, collected as a percentage share of GDP. To be more precise, education and health expenditures are calculated based on the share of government expenditure in total GDP. Education expenditure accounted for an average of 5.7 percent of GDP, while health expenditure consisted of an average of 3.453 percent in Uzbekistan. In addition to these independent variables other variables have also involved as controlling variables so as to represent the influence of them on economic growth of Uzbekistan during the provided time period and the statistical measurements of them are also provided in the following table as labelled below.



**Table 1**

**Descriptive Statistics**

Nº	Variable	Obs	Mean	Std. Dev.	Min	Max
1	Economic growth	32	1980.345	762.18	1140.38	3327.78
2	Expenditure Education	32	5.7	.624	4.127	7.002
3	Population	32	27515097	4212878.3	20952000	34915100
4	Gross Cap expenditure	32	28.081	8.06	14.65	43.93
5	Expenditure health	32	3.453	2.27	1.905	10.127

For conducting an empirical analysis, the role of correlation is vital in order to reveal the correlation between variables (table 2).

**Table 2**

**Correlation of Matrix**

Variables	(1)	(2)	(3)	(4)	(5)
(1) Economic_growth	1.000				
(2) Expenditure_Education	0.215	1.000			
(3) Population	0.966	0.392	1.000		
(4) Gross_Cap_expenditure	0.641	-0.019	0.516	1.000	
(5) Expenditure_health	-0.361	-0.144	-0.332	-0.356	1.000

Table 2 below provides information about the correlation results between variables. According to this, positive relationship is found between economic growth and expenditure to education and the relationship is found as being equal to 0.215 percent. This means that, this can be positive integration between economic growth and expenditure on education. In response to the correlation between population growth and economic growth revealed high correlation at 0.966 percent which might result in observing multicollinearity issue in the further notifications. In addition to this, the correlation between economic growth and gross capital formation is equal to 0.641 percent which means that, with high probability the influence of gross capital formation can be argued to be positive since positive integration has been revealed. The interesting outcome is observed in case of expenditure on health care, to be more accurate, negative correlation between expenditure on health care and economic growth is found as being equal to (0.361) percent, which means that changes in the level of expenditure on health might result in drop down of economic growth in case of Uzbekistan. On top of that, the correlation between other independent variables is also provided and it is essential to note that, there is not high correlated cases between concerned independent variables as stated in the table below.

This chapter of study is dedicated to examine the impact of concerned independent variables on change of economic growth in case of Uzbekistan. The following OLS regression analysis table 3 is going to represent the influence of selected variables and according to this, one percent changes in the expenditure level on education results in drop down of economic growth by 191 percent with statistically significance level at one percent level in case of Uzbekistan.

**Table 3**

**Linear regression**

Economic_growth	Coef.	St. Err.	t-value	p-value	[95% Conf	Interval]	Sig
Expenditure_Education	-191.591	38.163	-5.02	0.004	-269.896	-113.286	***
Population	0.0394	0.0015	25.91	0.000	0.003	0.0594	***
Gross_Cap_expenditure	13.392	3.256	4.11	0.000	6.71	20.073	***
Expenditure_health	-6.196	10.078	-0.61	.544	-26.875	14.483	



Constant	-2002.522	231.168	-8.66	0.000	-2476.84	-1528.203	***
Mean dependent var	1980.345		SD dependent var			762.180	
R-squared	0.980		Number of obs			32	
F-test	324.869		Prob > F			0.000	
Akaike crit. (AIC)	399.890		Bayesian crit. (BIC)			407.218	
*** $p < .01$ , ** $p < .05$ , * $p < .1$							

In addition to this, changes in the level of population growth also represent positive impact on economic growth of Uzbekistan, and one percent changes in the level of population growth results in growth of economy by 0.0394 percent with statistically significance at one percent level. In response to this, the influence of gross capital formation is also regarded as having positive influence on economic growth, to be more precise, one percent changes in the level of capital formation results in rise of economy by nearly 13.4 percent at one percent statistically significance level in Uzbekistan. However, changes in the level of expenditure on health illustrated negative integration with economic growth and one percent changes in the value of concerned variable leads to fall the economy by (6.2) percent but this is considered as statistically insignificant as shown in the table below. According to the outcome of the R-squared which is equal to 0.98, the changes of dependent variable is explained by 98 percent through the selected variables in the model. Further important statistical measurement is F-test which claims about the model specification validity and as the Prob>F is lower than 0.01, simple regression analysis below is accepted as valid in terms of explaining the impact of variables on the changes of economic growth. However, it is essential to note that, many scholars do not approve of the implication of the OLS model due to the high chance of biased results. That's why, as this study is based on time-series analysis, we find the ARDL bounds test more suitable for representing both short and long-run relationships between variables. We employ the OLS model to reveal post-estimation results and test the significance of the variables' impact on economic growth in Uzbekistan.

As stated above, one of the major reasons to conduct the OLS model is to give information about some essential model related issues as they are existing or not. Time series data is suffering some several issues based on the characteristics and those are heteroskedasticity, multicollinearity and stationery of the variables. Below the result of heteroskedasticity test is provided and according to the result of the test, it is concluded that null hypothesis is accepted as there is constant variance in change of residuals which is quite good for conducting further analysis.

### Heteroskedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of D. Economic\_growth  $\chi^2(1) = 1.13$

Prob >  $\chi^2 = 0.2886$

The table 4 below provides information regarding to one of the common issues in time-series data is autocorrelation and in order to check whether the variables are correlated with lags values of them, we need to conduct Breusch-Godfrey LM test for autocorrelation by involving 12 lags values. In response to the result of test, the variables are not correlated with lags values and this is also explained in the graphical case below and according to these shaded areas is that the lags values must not cross if it is crossed then those lags values are argued as correlated with present time period. Graphical explanation also supports the idea that, the model is free from autocorrelation issue as shown below (graph 1).

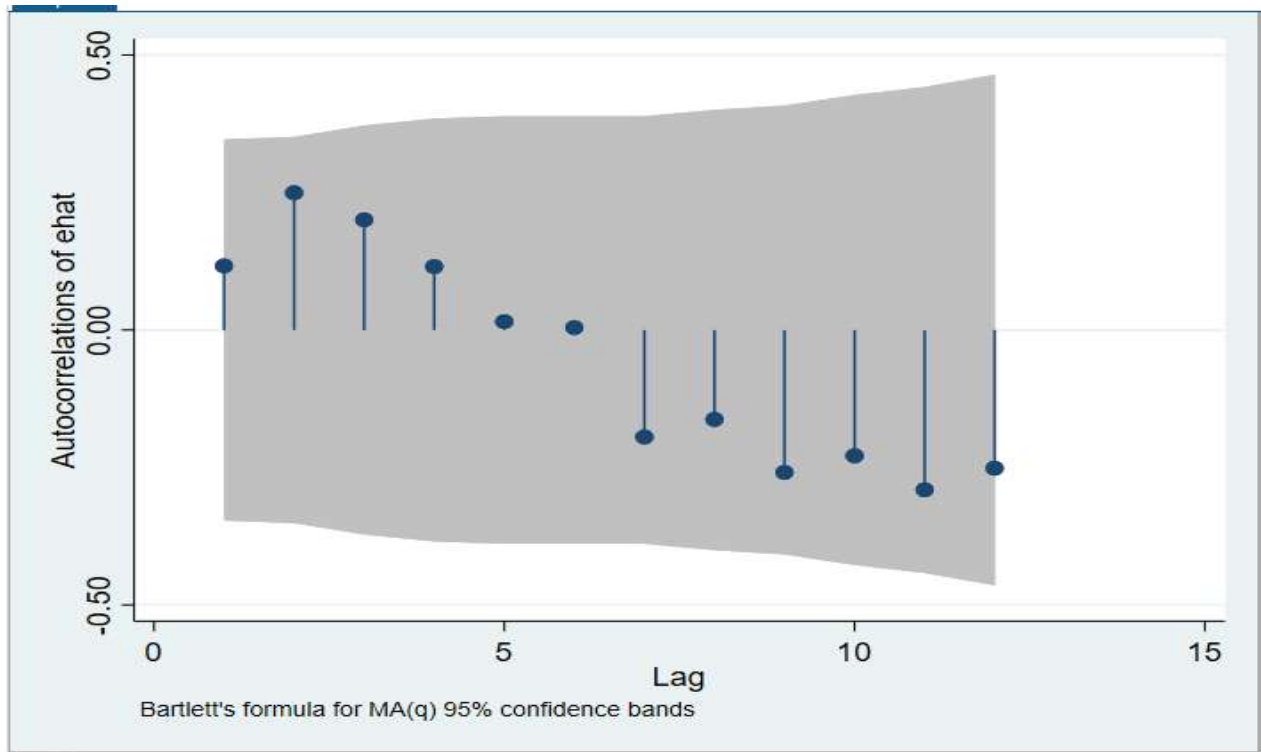


**Table 4**

**Autocorrelation**

Breusch-Godfrey LM test for autocorrelation chi2	df	Prob>Chi2
0.554	1	0.457
3.314	2	0.191
5.945	3	0.114
6.109	4	0.191
6.242	6	0.397
8.198	7	0.316
9.028	8	0.340
10.697	9	0.297
11.439	10	0.324
12.866	11	0.302
13.586	12	0.328

H0: no serial correlation



**Graph 1. Autocorrelations of ehat.**

As mentioned above, stationarity of variables is further major concern for time-series data since if variables are not found as stationary, then this causes to not having constant variance, mean and standard deviation when passing through time interval. Thus, in practice the variables are lagged in order to see the difference between variables are checked so as to find out stationary lag value of each independent variables. Below information about the stationarity of variables are provided and according to this, some of them are stationary at levels while others are found as stationary at first difference (table 5). Variables such as economic growth, expenditure on education and gross capital formation are found as stationary while other variables are evidenced as stationery at first difference. Observing

different levels of stationery can be advantageous in explaining the relationship between variables in both short run and long run estimations and below the outcome of them are given step by step.

**Table 5**

**Stationarity**

Variables	At Levels	At first difference	In difference
Economic growth	-6.835***		I (0) at difference
Expenditure on Education	-3.586**		I (0) at difference
Population		-2.335*	I (1) at first difference
Gross capital formation	-3.829**		I (0) at difference
Expenditure on health		-6.434***	I (1) at first difference

**Short-run and Long-run Estimations:**

Table 6 below provides information about the outcome of the ARDL bounds short-term test. As stated in the methodology part, the major concerned econometric model of this study is to implication of ARDL bounds test since we want to examine both short and long run relations between selected variables in case of Uzbekistan. In response to this, before implication of short and long estimations, we need to clarify the max lags value of variables which are essential to conduct the tests, and as presented in the regression analysis, these lags values are equal to in order (3,1,2,1,1) which is based on varsoc test analysis as given in the appendix below. In response to the test outcome, changes in the level of expenditure on education revealed positive impact on economic growth of Uzbekistan, to be more precise one percent changes in the level of expenditure on education results in rise of economy by 36.364 percent with statistically significant at one percent. In the literature review part, the perspectives and findings of many scholars have been reviewed and the outcome of this test is identical to major scholars' findings such as *Eggoh, Hilaire and Gillies, 2015*, they have also claimed positive and big role of educational progress in development of countries. Further the main independent variable is expenditure on health represented opposite result, to be more precise, one percent changes in the value of expenditure on health argued as results in slow down of economy by (0.168) percent which is statistically significant at one percent significance level. Observing a negative outcome is question of this study, this is because while some researchers have already claimed the adverse influence on expenditure on education in their studies, the share of them were minor by compared to other scholars who have claimed regarding to positive integration between expenditure on health care and economic growth. In addition to this, the results of other involved controlling variables are also exist and according to the result of them, one percent changes in the level of population leads to rise of economy by 0.038 percent with statistically significance at one percent, thus this can be argued that, rise the number of populations leads to development of economy in case of Uzbekistan. Further controlling variable gross capital formation represented negative influence on economic growth and one-point changes in the level of gross capital formation results in drop down of economy by (0.535) points but it is important to note that, the influence of this condition is found as not statistically significant which means that this outcome is not valid and can be biased estimation since we observed insignificant integration between variables (table 6).

**Table 6**

**ARDL Short run (3, 1, 2, 1, 1) regression**

Sample: 1994 - 2022		Number of obs = 29				
F (12, 16) = 1362.17		Prob > F = 0.0000				
R-squared = 0.9990		Adj R-squared = 0.9983				
Log likelihood = -133.01894		Root MSE = 31.9853				
Economic_growth	Coef.	Std.Err.	t	P>t	[95%Conf.	Interval]
Economic_growth						
L1.	1.155	0.232	4.980	0.000	0.664	1.646
L2.	0.239	0.479	0.500	0.624	-0.777	1.256
L3.	-0.479	0.233	-2.060	0.056	-0.973	0.014
Expenditure_Education						
--.	36.364	10.824	3.359	0.005	9.900	52.628
L1.	-44.886	23.681	-1.900	0.076	-95.088	5.315
Population						



**Inson kapitali**

--	0.038	0.006	6.330	0.000	0.014	0.075
L1	-0.000	0.000	-0.780	0.448	-0.000	0.000
L2	0.000	0.000	0.460	0.652	-0.000	0.000
Gross_Cap_expenditure						
--	-0.535	2.992	-0.180	0.860	-6.878	5.807
L1	1.474	2.978	0.500	0.627	-4.839	7.788
Expenditure_health						
--	-0.168	0.051	-3.295	0.006	-1.725	1.388
L1	-0.654	4.592	-0.140	0.889	-10.388	9.080
cons	-182.58	369.384	-0.490	0.628	-965.637	600.481

Before analyzing the long run estimation, we need to conduct the Pesaran/Shin/Smith (2001) ARDL bounds test which is dedicated to reveal whether there are long run relationships or not. As stated in the test below, null hypothesis claims regarding to no levels relationship while alternative hypothesis claims about levels relationship. In order to accept or reject the null hypothesis, there are two F and t tests are given and according to the outcome of the tests, we found availability of long run relationship between variables. This is because the value of F-test is higher than upper critical values which is equal to 4.010 and this is argued as enough to come above conclusion. The same logic also works under t-test evaluation and both tests reveal long run relationship between variables (table 7).

**Table 7**

**Bounds test**

Note: estat btest has been superseded by estat ectest as the prime procedure to test for a levels relationship. (click to run) Pesaran/Shin/Smith (2001) ARDL Bounds Test

H0: no levels relationship							
F = 4.189				t = -3.640			
Critical Values (0.1-0.01), F-statistic, Case 3							
[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]
L_1	L_1	L_05	L_05	L_025	L_025	L_01	L_01
2.450	3.520	2.860	4.010	3.250	4.490	3.740	5.060
accept if F < critical value for I(0) regressors reject if F > critical value for I(1) regressors Critical Values (0.1-0.01), t-statistic, Case 3	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]
[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]
L_1	L_1	L_05	L_05	L_025	L_025	L_01	L_01
-2.570	-3.660	-2.860	-3.990	-3.130	-4.260	-3.430	-4.600

accept if t > critical value for I(0) regressors  
 reject if t < critical value for I(1) regressors  
 k: # of non-deterministic regressors in long-run relationship  
 Critical values from Pesaran/Shin/Smith (2001)

The table 8 below is going to reveal the long run regression analysis since we found regarding to this in the above estimation. According to this, the results of some variables are indicated opposite signs by compared to short run estimation. To be more precise, changes in the level of expenditure on education represents negative integration and one percent changes in the value of expenditure on education causes to slow down of economy by (99.6) percent which is found as statistically significant at five percent significance level.

In addition to this, changes in the value of population growth also revealed positive outcome as it has been in the short run estimation and one percent changes in the level of population growth causes to rise of economy by 0.030 percent in the long run and it is argued as statistically significant at 5 percent





level. On top of that, changes in the level of gross capital formation are also revealed positive impact and one-point changes in the level of gross capital formation results in rise of economic growth by 10.981 percent but it is essential to point out that, the influence factor is not strong as we observed statistically insignificant outcome.

**Table 8**

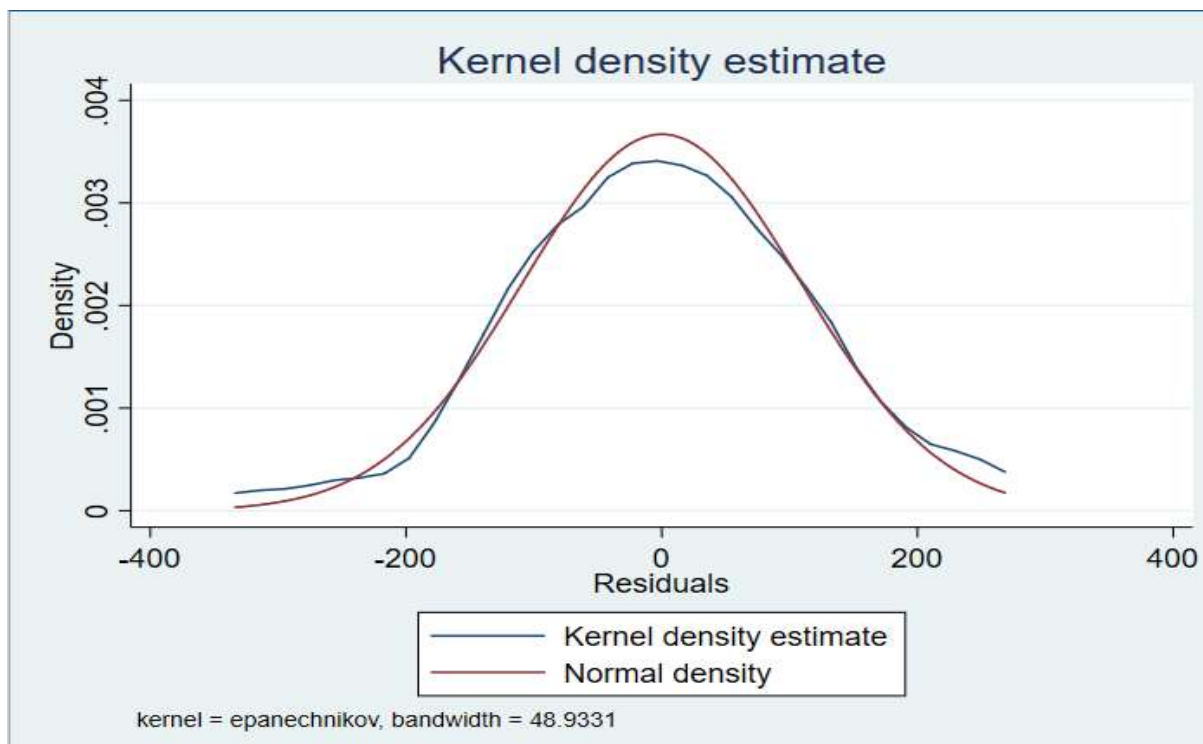
**ARDL Long run (3,1,2,1,1) regression**

Sample: 1994 - 2022			Number of obs = 29			
R-squared = 0.8383			Adj R-squared = 0.7169			
Log likelihood = -133.01894			Root MSE = 31.9853			
Economic_growth	Coef.	Std.Err.	t	P>t	[95%Conf.	Interval]
<b>ADJ</b>						
Economic_growth						
L1.	-0.086	0.034	-2.520	0.032	-0.369	0.198
LR						
Expenditure Education	-99.633	43.995	-2.260	0.034s	-228.871	29.605
Population	0.030	0.013	2.220	0.041	0.001	0.021
Gross_Cap_expenditure	10.981	29.851	0.370	0.718	-52.299	74.262
Expenditure_health	-9.613	50.731	-0.190	0.852	-117.157	97.932
<b>SR</b>						
Economic_growth						
LD.	0.240	0.302	0.790	0.438	-0.400	0.881
L2D.	0.479	0.233	2.060	0.056	-0.014	0.973
Expenditure_Education						
D1.	44.886	23.681	1.900	0.076	-5.315	95.088
Population						
D1.	0.000	0.000	0.840	0.413	-0.000	0.000
LD.	-0.000	0.000	-0.460	0.652	-0.000	0.000
Gross_Cap_expenditure						
D1.	-1.474	2.978	-0.500	0.627	-7.788	4.839
Expenditure_health						
D1.	0.654	4.592	0.140	0.889	-9.080	10.388
cons	-182.58	369.384	-0.490	0.628	-965.637	600.481

The further vital variable expenditure on health care represented negative influence on economic growth of Uzbekistan in the long run and according to the observed outcome it can be clear that one percent changes in the level of expenditure on healthcare causes to reduction of economy by 9.613 percent but it is considered as statistically insignificant as p-value is more than 0.1. In response to the R-squared value under long run ARDL estimation model, it is equal to .83 which means that, the changes of dependent variable namely economic growth are explained by 83% through the selected independent variables which is quite high to concern the effect of them on economic growth in case of Uzbekistan.

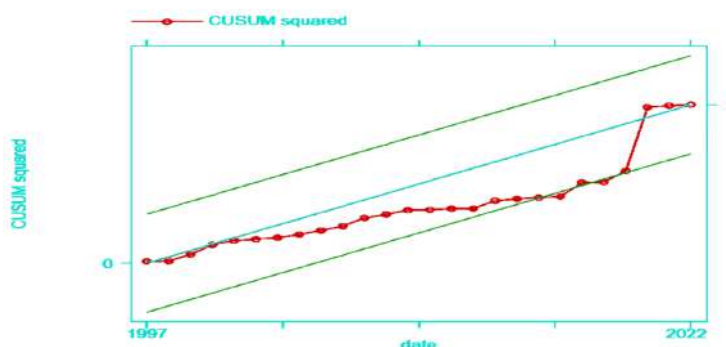
**Post-Estimations:**

This section of study is devoted to reveal information about the outcomes of some post-estimations in order to claim the validity of the focused econometric model and along with integrated data. The following graphs which is Kernel density estimation test provides information about normality of the sample data by compared to population data, in response to this, the sample data is marked with blue line while red line indicates about population, as it can be seen while there are some differences in data normality, in general view the sample data gives normality shape (graph 2).



**Graph 2. Kernel density estimation.**

Based on the result of the regression analysis, the ARDL model can be argued as passing properly all-important post estimation tests and the following graph is going to reveal about stability test which is CUSUMSQ shows availability of short-term parameters as illustrated in the graph below. CUSUMSQ test is created by Shin and Pesaran in 1999, and according to the result, the stability test is staying between critical boundaries at five percent significance value. Thus, the results represent that, the variables have accurate short-run parameters which have effect on economic development in case of Uzbekistan throughout the selected time period (graph 3).



**Graph 3. CUSUM squared.**

**Conclusion and suggestions:**

As stated, several times above, this study has examined the impact of expenditure on health and education on economic growth in case of Uzbekistan from 1991 to 2022. In order to represent the true value and impact factors of each variable after reviewing various papers, the ARDL bounds test has decided to employ so as to reveal short and long run estimations of chosen variables on economic growth. Based on the outcome of the study this can be concluded that, making and investment on education is going to pay off much more positive rather than that of health care under the condition of Uzbekistan. This is again very discussing situation due to the influence of expenditure on education represented positive





integration in the short run while that of illustrated negative influence in the long run. In addition to this, except those variables other controlling variables are also involved in the study and the relationship of them have presented almost the same result as stated in many scholars and researchers' studies.

Uzbekistan is considered as one of the developing countries and low-income nations around the world, thus we need to acknowledge that, there are lots of duties need to be accomplishment in a head yet. However, if we look back of many developed countries such as Japan and China, they have been in trouble as well in terms of rising the living standard of people and because of their true political strategy which has been build on rising the level and quality of education and health care those nations are regarded as top 5 nations around the world in all walks of life. Thus, Uzbekistan is also need to allocate budget on development of those two essential spheres such as education and health care, because we need to change the directional way of development from agriculture to industries by rising the literacy level of people.

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