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**HUMAN CAPITAL AND ITS COMPONENTS.. STATISTICAL
ANALYSIS OF BUDGET IN RUSSIA**

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Abstract

In the time of the post-industrial economy, human capital becomes more and more important in a country's economy. The results of different studies identify human capital as an important determinant of regional development (Flückigera & Ludwigb, 2018). Another feature of any modern economy is high-skilled export that plays the most important role in the international trade. However, high-skilled export is affected by human capital, because only a professional can create new technologies and produce highly qualified labor. These facts lead to the necessity of evaluation of human capital. We use a lot of statistical indexes for such kind of evaluation. The most generalizing index is the human development index (HDI). In Russia the volume of this index is lower than in other countries even with a smaller budget size. It makes us raise the issue of the efficient usage of budget's money. This research shows that the components of the HDI are connected with the government expenditures on education and healthcare. In other words, the government can increase the volume of expenditures in these two sectors, thereby increasing the level of human wellbeing and the level of life quality. Besides, the development of both education and healthcare is necessary for the intensive way of the economic development.

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1. Introduction

The 21st century is an era of innovations and technologies. A few decades ago resources and money played a great role in the economy. Nowadays, the professionals, who are able to create new things, influence the economic development. There are new trends in the international trade, too. Today, high - quality goods influence the international exchange. A country should have well-educated specialists to create such goods. It means that the education system affects the economy a lot and the government should pay much attention to its development. Although a good education is necessary for the development of the economy, it is not enough for its success. Human capital and economic growth have feedback effects in the long term and no effect in the short term (Banoa, Zhaoab, & Ahmada, 2018). Many researchers develop growth models with human capital accumulation and consider several fiscal instruments to finance the increase in government spending: transfers to households, output, capital and labor taxes (Dissou, Didic, & Yakautsava, 2016).

Obviously, our country should have a good living standard for highly-qualified specialists to be satisfied with their life here. This includes such issues as social stability, a high level of healthcare and income, accessibility of education. We can not evaluate all these factors directly in numbers, except the income. Different social indexes should help us to do this. The most generalizing index (as it was mentioned before) is the human development index (HDI). The HDI is a complex statistic calculated every year to compare human welfare in different countries all over the world.

The HDI consists of 3 indexes that represent different aspects of humans' life (About human development, 2016). The first index is life expectancy at birth - that shows the quality of healthcare in the country because it is healthcare that affects peoples' life expectancy. The second index is an education index calculated by the mean year of schooling and the expected years of schooling; all these indexes show the quality of education, its availability and popularity. The last index is the gross domestic product per capita that shows us the wealth of the country. Thus, using the HDI we can evaluate many social processes. The HDI summarizes other indexes of human well-being. That's why it is important to review this index to understand the current economic and social situation in the country. We used this index in our research to show the situation in Russia and compare it with that in other countries.

2. Problem Statement

Russia is the largest country in the world. Moreover, it has the richest reserves of mineral resources such as oil, gas, metals. Russia is on the 9th place in the countries' population rating and on the 23rd place of the budget size rating. In other words, the country has excellent quantity indexes. But, when it comes to indexes showing quality and efficiency of resources usage, the figures are not very good. Let us characterize the HDI. Russia is on the 49th place, according to the HDI rank. It is at the bottom of the countries list with high HDI. In the following table you can see Russia's three indexes of the HDI in comparison with Norway, one of the world leaders in HDI. It should be noted that Norway is a gas-exporting country, too. This fact explains the importance of comparison between the two countries.

The table shows that, on the one hand, the Russian government expenditures exceed the Norwegian ones by 19%. But, on the other hand, the Russian HDI is 20% lower than the Norwegian one.

The situation is the same with the components of the HDI, which are presented in table 2. The last line in this table shows the value of the Russian indexes divided by the Norwegian indexes.

Table 01. Russia in the world HDI rank (Human development data, 2015; Human development reports, 2016).

Year	Leaders		Russia					
	Country	Leader's HDI	HDI	Place	LE, years	EYS, years	MYS, years	GDP per capita
2010	Norway	0.939	0.785	65	68.6	14.0	12.0	22424
2011	Norway	0.941	0.792	66	69.1	14.3	12.0	23359
2012	Norway	0.942	0.799	55	69.5	14.6	12.0	24094
2013	Norway	0.945	0.803	57	69.9	14.9	12.0	24258
2014	Norway	0.948	0.805	51	70.1	15.0	12.0	24067
2015	Norway	0.949	0.804	49	70.3	15.0	12.0	23286

Table 02. Comparison of HDI components of Russia and Norway (Human Development data, 2015)

	Healthcare index	Education index	Income index
Russia	0.773	0.816	0.823
Norway	0.949	0.916	0.984
Russia/Norway	0.814	0.890	0.836

As you can see, two of the three indexes have a gap of 20%. This situation raises the issue of the efficiency of the budget resources allocation. The share of the high-skilled goods export can be another indicator of economic situation. It shows the country's dependence on high-skilled goods exported and the ability to produce this goods in the country. Table 3 shows the place of Russia in the world, taking this share into consideration. All the numbers presented in the table have been calculated by the total export volume and high-quality export volume according to UNCTAD (United Nations Conference on Trade and Development) methodology. We can see that in 2016 Russia loses 0.9 p.p. to Norway and about 24.5 p.p. to the USA, one of the world leaders by this index.

Table 03. Comparison of the shares of high-skilled export (International trade in goods and services, 2018)

Year	Share of high-skilled export		
	Russia	Norway	USA
2010	4.71%	6.91%	33.02%
2011	4.84%	5.74%	30.60%
2012	5.89%	5.01%	29.75%
2013	6.00%	5.21%	29.48%
2014	6.65%	5.77%	29.51%
2015	8.45%	7.32%	31.11%
2016	7.03%	7.93%	31.49%

Thus, having the richest reserves of mineral resources and huge opportunities for economic growth, Russia is lagging behind the other countries with the same or bigger budget size (Gumenyuk, 2017; Winters, 2011). This leads to the issue of right allocation and efficiency of resources usage.

3. Research Questions

In the conducted research, we studied a few interdependent indicators. Taking into consideration the fact that the free healthcare and the universal school education are guaranteed in Russia (Constitution of Russian Federation), we can say that the expenditures on these sectors are covered by the budget money. So, the quality of services in these sectors can indicate the quality of the government's expenditures. In their turn, these expenditures appear to affect the relevant indexes of the HDI. In order to analyse the relation between the indexes, we studied the federal and subjects' budgets. Another question we tried to answer in this research is whether the HDI can affect the high-skilled export, which is the most important part of the international trade.

4. Purpose of the Study

The purpose of this study is to find out how the government expenditures affect different parts of the HDI and if there is an interdependence between the HDI and the high-skilled export.

5. Research Methods

In order to understand the interdependence between the reviewed variables, we chose and analysed the period from 1995 to 2015. Our choice is conditioned by the availability of the data. We analysed the following variables: the government expenditures on the education, the government expenditures on the healthcare, the shares of these expenditures in the consolidated budget, the life expectancy, the mean years of schooling, the expected years of schooling, the volume of high-skilled goods in the export. To understand whether these variables have any connections, we built the correlation matrix. You can see the results in table 4.

Table 04. Correlation matrix (calculated by the authors)

X1	X2	X3	X4	LE, years	EYS, years	MYS, years	X5	
1.0000	-0.5063	0.9931	0.4609	0.9715	0.9115	0.7978	0.9716	X1
	1.0000	-0.5455	-0.2184	-0.4682	-0.5116	-0.5412	-0.4451	X2
		1.0000	0.5341	0.9653	0.9049	0.7927	0.9576	X3
			1.0000	0.4287	0.4564	0.3779	0.4420	X4
				1.0000	0.8007	0.6572	0.9329	LE
					1.0000	0.9161	0.9058	EYS
						1.0000	0.7739	MYS
							1.0000	X5

(Abbreviations in table 04: X1 – expenditures on education, bln rubles; X2 – share of the expenditures on education; X3 – expenditures on healthcare, bln rubles; X4 – share of the expenditures on healthcare; X5 – high-skilled export, ml US dollars)

According to the analysis, there is a high correlation between the direct expenditures on the education and the healthcare and the relevant parts of the HDI. As for the high-skilled export, there is a high correlation index between it and the expenditures on the education. Moreover, the correlation indexes show the interdependence between the high-skilled export and the components of the HDI. This interdependence proves the assumption that the life quality affects the economic indicators. There are low

correlation indexes for the shares of the government expenditures. It can be explained in the following way: despite of the budget size changing, the share of the social expenditures remains approximately constant (look at table 5). Such variable can lead to the lack of relations and low correlation indexes.

Table 05. Shares of expenditures on the education and the healthcare (Federal budget, 2017; Education in Russian Federation, 2006; Healthcare in Russia, 2007)

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015
Share of expenditures for education	11.80%	11.76%	11.11%	10.75%	11.16%	11.04%	11.42%	11.00%	10.20%
Share of expenditures for healthcare	12.14%	10.92%	10.30%	9.70%	9.67%	9.85%	9.17%	9.17%	9.62%

To provide a wider picture of variables' interdependence, we conducted the regression analysis for several pairs of these variables. This analysis was conducted by the Ordinary Least Squares.

The first pair to analyse is the life expectancy and the government expenditures on the healthcare. We take a log of 5 years for this model. During the research, we came to the conclusion that the government expenditures do not affect the economy during the time of their usage. To allow these expenditures to affect the healthcare system, some time must pass. And after that, even more time must pass for the relevant indexes to be changed. That is why the log was used in this model. In the following figure, you can see a graphical interpretation of this model. This graph shows that there is a connection between life expectancy and the logged expenditures on healthcare.

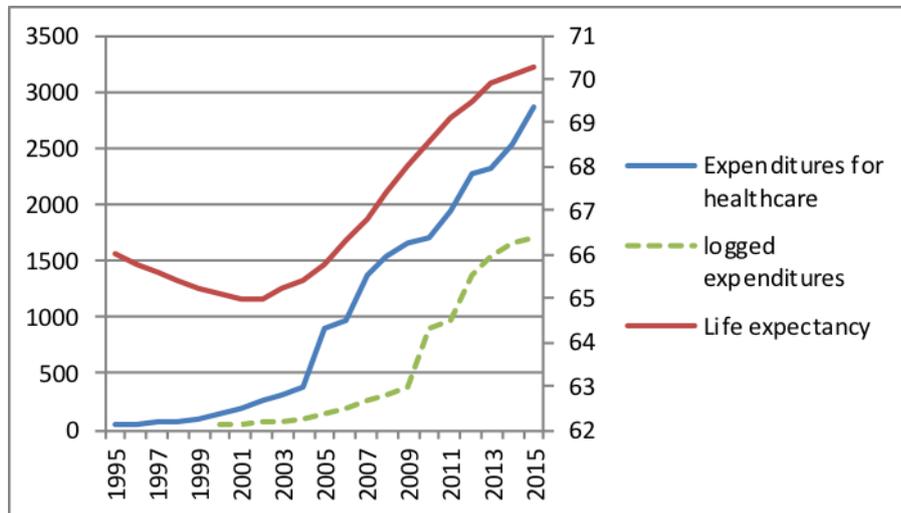


Figure 01. Life expectancy and the government expenditures on the healthcare (Federal budget, 2017; Human development data, 2015)

In order to provide a more accurate analysis, we used the mathematical interpretation, which is given in table 6.

Table 06. Results of the regression analysis (calculated by the authors)

R ² = 0.9216	Coefficient	Standard error	t-statistics	P-value	Significance
Dependent variable: life expectancy					
const	65.5192	0.3028	216.4	4.48e-026	***
Expenditures for healthcare, bl rubles	0.00299	0.0002	12.75	4.22e-09	***

In this model we can see that the R-squared exceeds 0.8; it means that the model is statistically acceptable. The significance of the variable is determinate according to P-value: if this index is less than 0.001, the variable is very significant. The data given in this model prove that the government expenditures on the healthcare strongly affect the life expectancy.

The second model was created to find the interdependence between the components of the education index and the government expenditures on the education. In the following figure there is a graphical interpretation of the models with MYS (mean years of schooling) and EYS (expected years of schooling) as the dependent variables. There is no such obvious interdependence as in the healthcare model. To understand the relations between these variables, the mathematical interpretation is given in table 7. According to this analysis, both MYS and EYS are affected by the government expenditures on education. The R-squared in these models are lower than in the previous models, but the meanings higher than 0.8 tells us that these models are still acceptable and statistically significant. In both models the expenditures on the education are significant variables, because p-value is lower than 0.001.

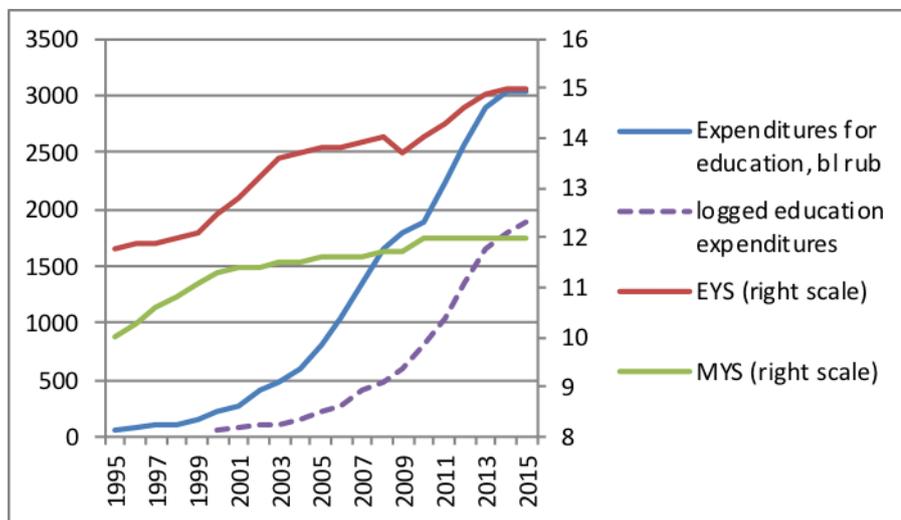


Figure 02. Expenditures on the healthcare, the mean and the expected years of schooling (Federal budget, 2017; Human development data, 2015)

This mathematical model is presented in table 8. You can observe the contradiction in the calculation. On the one hand, we have the high significance of the HDI growth rate as an explanatory variable, but on the other hand, R-squared in this model is less than 0.5. It may indicate that the model has a large statistical error and we can explain this in the following way: the value of the high-skilled export depends on huge amount of factors that we can not evaluate in numbers, e.g. political situations and different sanctions. Anyway, studying these factors was not the purpose of the present research.

Table 07. Results of regression analysis (calculated by the authors)

	Coefficient	Standard error	t-statistics	P-value	Significance
Dependent variable: Expected years of schooling ($R^2 = 0.813$)					
const	13.2365	0.1847	71.64	2.31-019	***
Expenditures for education, bl rubles	0.00100	0.00013	7.452	3.09-06	***
Dependent variable: Mean years of schooling ($R^2 = 0.8079$)					
const	11.4638	0.04309	266.0	2.48e-027	***
Expenditures for education, bl rubles	0.00035	4.9e-05	7.198	4.58e-06	***

The final model is created to check the assumption about the influence of the HDI expenditures on the high-skilled export.

Table 08. Results of regression analysis (calculated by the authors)

	Coefficient	Standard error	t-statistics	P-value	Significance
Dependent variable: growth rate of high-skilled export $R^2 = 0.4905$					
const	27.142	5.182	-5.237	5.57e-05	***
Growth rate of HDI	28.04	5.151	5.445	3.58e-05	***

6. Findings

The reviewed models show the following results:

1. Being a part of the HDI, the life expectancy is heavily affected by the government expenditures on the healthcare.
2. Being a part of the HDI, the expected years of schooling and the mean years of schooling are heavily affected by the government expenditures on the education.
3. The relations between the HDI and the high-skilled export can not be described by using only measurable variables because there are lots of immeasurable factors that affect the international trade.

7. Conclusion

To sum up, the reviewed models show us that the government expenditures affect the relevant parts of the HDI. This means that the vectors of the government expenditures influence both human wellbeing and the HDI. Moreover, the expenditures on education affect the volume of the high-skilled export, which is a very important part of the economy. Thus, allocating budget resources, the government should take into consideration the education and the healthcare. Only under such conditions the intensive and high-skilled development of our economy is possible.

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