

## Study of Human Capital Development, Economic Indicators and Environmental Quality

Mayis G. Gulaliyev <sup>1\*</sup>, Rashad S. Muradov <sup>2</sup>, Leyla A. Hajiyeva <sup>2</sup>, Hijran R. Muradova <sup>2</sup>, Konul A. Aghayeva <sup>3</sup>, Elnur S. Aliyev <sup>2</sup>

<sup>1</sup> The Institute of Economics of Azerbaijan National Academy of Sciences, AZERBAIJAN

<sup>2</sup> Azerbaijan State University of Economics (UNEC), AZERBAIJAN

<sup>3</sup> Azerbaijan Architecture and Construction University, AZERBAIJAN

\* Corresponding author: MayisGulaliyev@hotmail.com

### Abstract

This paper has structured the simultaneous equations including the human capital development, economic indicators and environmental quality in the period from 2002 to 2016. Acknowledging the economic value of services helps to understand that we are part of nature and have a duty to live responsibly. Human capital is widely viewed as playing an essential role in the creation of wealth and economic growth, however, our understanding of the relationship between environmental quality and other elements of human capital is just emerging. There is a strong correlation between the GDP / Oil Price and human capital expenditures ( $r = 0.83$ ). Correlation between the state spending on human capital development and the GDP growth ( $r = 0.995$ ) is higher than if the first variable was family spending ( $r = 0.9$ ). There is a strong inverse interrelation between the level of poverty in society and total expenditure aimed at human capital ( $r = -0.95$ ). The hypothesis saying that investment in human capital return in 2-4 years was not exactly true. From the econometrical result, it is concluded that there is a significantly negative relationship between environmental quality and the imbalance of economic indicators; the improvement of human capital can reduce the detrimental effects from the differences in income distribution and better the environmental quality.

**Keywords:** human capital, environmental quality, revenues of population, developing economy, autocorrelation analysis

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### INTRODUCTION

Environmental issues, as climate change or air pollution, harm welfare and push households to react. Among other explanations, pollution affects agents' well-being by damaging their health status (through mortality and morbidity) and by depreciating the environmental quality bequeathed to future generations. Environment, economics and human capital is a unique interdisciplinary degree that advances your critical abilities to tackle real-world environmental challenges, manage economic and social pressures in a sustainable manner, and integrate the benefits that people derive from the environment into policy decisions and practice. It focuses on ecosystem services as the linkages between human and natural systems, and the need for a holistic socio-ecological approach to understand challenges and solutions to environmental conservation and sustainable development. Human capital is widely viewed as playing an essential role in the creation of wealth and economic growth, particularly in developing countries; however, our

understanding of the relationship between environmental quality and other elements of human capital is just emerging. While the impacts of adverse environmental conditions on health are reasonably well understood, our understanding of its relationship to other elements of human capital is not fully formed. Early evidence suggests negative effects on cognitive ability, and school and job performance.

In some cases, investments into non-productive sphere, including education and fundamental sciences, are considered as an additional burden on the economy (Chueva et al. 2016, Giroux 2017, Postiglione 2015). That is why, in most countries, this sector takes a very small part of GDP (Cash 2016, Hulten and Ramey 2017, Lutz et al. 2017). In particular, in small countries the absolute amount of funds allocated to these areas is quite small (Kaminsky et al. 2001, Aşan et al. 2017).

However, the study of the logic of economic development in different countries of the world gives a reason to say that the countries, where to education and

fundamental science spheres is allocated more resources and ensured their efficient use, are developing and consequently they achieve an economic growth (Gabe 2017, Hafer 2014, Hanushek and Woessmann 2016, Oztunc et al. 2015, Raut 2017). An existence of a deep correlation between GDP and expenditure on education and health in the countries of the world indicates that an ecological economic development in the modern period largely depends on the degree of development of human capital.

Human capital is an integral part of the national wealth of each country's economy. We adhere to the definition of human capital as the health, knowledge, abilities, and skills acquired by a person throughout his/her life, which formed because of investments and can be used in the process of social reproduction (Fitzsimons 2015). This capital contributes to the growth of environmental quality and increase in employee's income.

Now there is no one denying that the national wealth of any country, along with the cost of the physical, financial and natural capital also includes the cost of human capital (Budhwar and Debrah 2013, Cinnirella and Streb 2017, Jameel and Naeem 2016).

The modern economy is the most knowledge-based, therefore, the human capital based on knowledge and skills, is a leader of the national wealth (Morel 2015). As a result, relations between states and economic strength are not measured by the size of territories, but by the share of human capital in national wealth. Yet since the 50s of the last century, the idea of ownership of "even more territories" was replaced by the idea of owning of the larger and more qualitative human capital (Gambardella et al. 2015).

It is necessary to take into account that in contrast to the natural capital, the human capital depends on public awareness of community and governance. If the state does not allocate at all or allocate insufficient investments for improving the living conditions of the population, the development of education and health, and the level of human capital will also significantly decrease (Unger et al. 2011). In order to develop the human capital from the "potential" state to the state of "the cost of creating added value", the state should have special programs and effective management system. Human capital is a cost that brings benefit. However, unlike the other types, this value is associated with the knowledge and skills, culture and mentality, ideology, creativity and health. Already a standard of health has become the one of the factors for wage differentiation

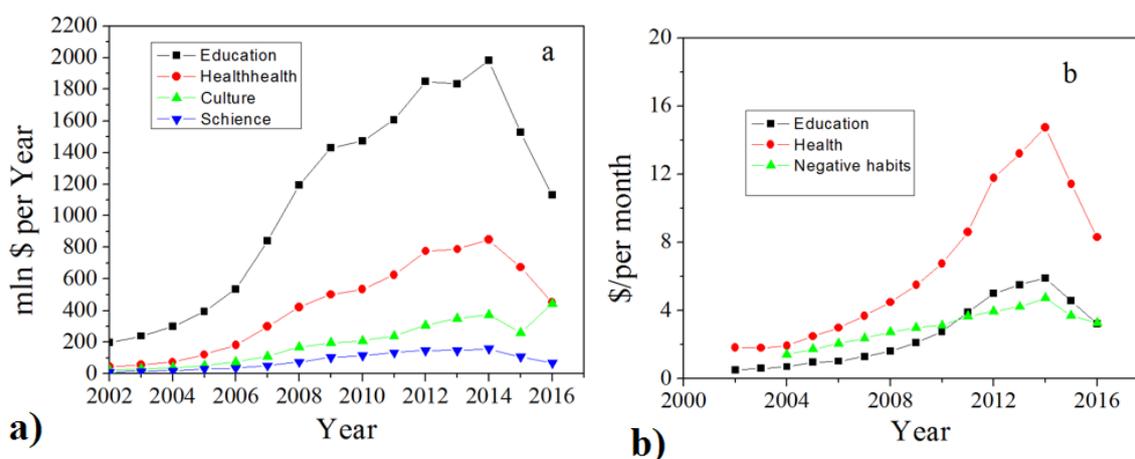
(Phelps 2017). The human capital is created from the internal transformation of the person (Coleman 1988, Oncel-Acir et al. 2017).

Sometimes, human capital is divided into three sub-capital related to health, education and environment (Martin et al. 2013). Capital related to the health, is the sum of the investment used for the restoration and preservation of human health. There is no doubt that any qualified employee, bringing economic benefits to a society at a certain age period, at all stages of his/her life may face with the health problems (Arnold 2005). The birth of a healthy child, his timely normal diet starting from infancy, preventive protection against infectious and other diseases at all stages of his/her life is of a great importance for the future of the normal physical and intellectual development. Getting the proper education or development of any profession is based on ensuring of the physical and biological health. Therefore, reproduction of human capital is associated with education, acquisition of new knowledge and skills, health protection and labor migration from low-productivity regions to the regions with high productivity (Hawe and Shiell 2000). There is no doubt that the influx of oil revenues had a significant impact on the entire economy, including its social sphere. Therefore, we analysed the behaviour of human capital expenditures and their effect on GDP and nominal GDP/Oil price. We also analyzed the effect of environmental quality in human capital on the poverty level and year income per capita in oil-based countries based on principles of ecological economics, in our case – in the Republic of Azerbaijan. Autocorrection analysis allowed building a hypothesis about investment inhuman capital returning in 2-5 years.

## METHODS

Research subject is the Republic of Azerbaijan. At the end of 2006, official oil reserves of the Republic amounted to 7Bbbl (1 bt), in other words – 0.6 % world's reserves (Effimoff 2000). We considered two sources of investment in human capital, namely –state and family budget spent in the period from 2002 to 2016. Budget expenditures can be divided into the following four groups:

- 1) costs allocated to education, total;
- 2) costs allocated to health, total;
- 3) the costs allocated to science;
- 4) the costs allocated to art and culture, media and sport.



**Fig. 1.** State spending on human capital over the past 14 years

The autocorrelation model and Pearson correlation coefficient were used to identify the effect of investment in human capital on GDP, nominal GDP (GDP/oil price), poverty level, and year income per capita. The model is built on data available from the Azerbaijan State Committee of Statistics.

## RESULTS AND DISCUSSION

### Dynamics of Investments Allocated to the Formation of Human Capital in Azerbaijan

**Fig. 1** shows state spending on human capital over the past 14 years.

As can be seen from the **Fig. 1a**, over the past 14 years, funds from the national budget allocated to the development of education, rose by about 10 times, and the funds allocated for the development of the health sector - 20 times. This also applies to the amount of funds allocated from the state budget for the development of art and culture, media and sport. During the same years, there was a sharp increase in the volume of funds allocated for the development of these areas (Chapmana et al. 2005). However, it should be borne in mind that, though there was a sharp increase in the absolute volume of funds allocated for human capital formation from the budget expenditures, the share of total expenditures has steadily been decreasing in the budget. So, in 2002, the funds allocated from the budget for human capital formation accounted for 29% of all budget expenditures. In 2015 and 2016, their share decreased respectively by 15.1% and 18.3%. In other words, the social orientation of the budget of Azerbaijan has decreased significantly over the past 14 years. Over the years, the main expenditures of budget were more focused in infrastructure projects, so the share of

expenditure on human capital formation in the budget has decreased.

The heaviest were expenditures on education, the lowest – on science (**Fig. 1a**). Education system development is of great importance for national economy of countries with potential for oil production, but science stagnation may have a negative effect (Colombo et al. 2005). Economic development of the Republic of Azerbaijan is driven the accumulation of oil revenues in the State Oil Fund of Azerbaijan and the transfer of a certain part of these revenues to the budget also create conditions for the rapid growth of budget expenditures. Undoubtedly, the growth of budget revenues has created a good opportunity to raise the amount of funds allocated for education, health, art and culture, media and sport. Despite the natural reserves, however, the country has to boot science as other developed countries did, such as Japan and the USA (Atkinson and Grillner 2010).

As noted above, in addition to budgetary expenditure, other private sources also are widely used in Azerbaijan for human capital formation. The main type of such sources is family budgets (**Fig. 1b**). The presence of the share of expenditure on education and health care in the household budget expenditures relates not only to the formation of public consciousness in the Azerbaijani society, but also with the general liberalization of legislation in the field of education and health **Fig. 1b**. **Fig. 1b** shows the behavior of family expenditures on education, healthcare and cultural development, as well as on bad habits, that affected human capital development over the last 14 years.

**Fig. 1b** shows that since 2008 the share of spending on education and health of the family budget is steadily increasing. At this point, healthcare gets more fund support than other items from the list. To the greatest extent a growth of the funds from family budget on the development of these spheres, on a background of reducing of the overall share of funds allocated from the state budget, is due to an expansion of the level of liberalization of the economy (Kaser 2003). Namely from this time, there have been made more serious steps to liberalize the economy of Azerbaijan. At the crucial stage of the formation of human capital, which is the stage of a higher education, more than 70% of students are studying at their own expense. This means that at the stage of a higher education it is spent 2 times more money from the household budget than of the state budget expenditures. If you also add the expenditure of students getting education abroad at their own expense, we can confidently assert that the amount of funds allocated from the family budgets to education significantly more than funds allocated from the state budget. However, these expenditures are not reflected in official statistical reports, thereby it is very difficult to calculate their effect on the formation of human capital. Therefore, we make an analysis only based on official statistics.

In Azerbaijan, the vast majority of the population does not use the services of medical insurance, so the most health care costs are paid for by the family budget.

However, as it can be seen from **Fig. 1b**, according to official statistics, these expenditures are not made up the largest share of the family budget. The same pattern can be observed in the expenditure on education. For example, most of the students studying in the senior classes of secondary schools additionally are involved in the preparatory courses of the high cost. A significant part of the family budget is spent on such payments. However, despite the fact that according to official statistics, education and health care expenditures are not made up the largest share of the family budget, for the last 14 years, the share of these expenditures grew steadily. If they accounted for about 6% in 2002, then in 2016 their share rose up to 6.7%. Similarly, the majority of household spending on health care is not included in the official statistics, so spending on health care did not have a high share in total consumption. So, according to statistics of World Health Organization the private spending on health care amounted to 758 international dollars in Azerbaijan in 2013. That, at least, three times more than the amount of health care expenditures, as shown in **Fig. 1b**. These significant differences between

formal and informal payments related to the cost of health care from family budgets, clearly marked in the reports, jointly prepared by the Ministry of Health of the Republic of Azerbaijan and the World Health Organization (Health expenditure, World Bank Data, 2013).

Along with the spending that has a positive effect, there are expenditures that have a negative impact on the formation and development of human capital. Typically, the state is seriously interested in the development of human capital, and is seeking to reduce the costs and impediments to its development. One of the major obstacles to the formation and development of human potential and human capital is the support of bad habits, at whatever level it may be. **Fig. 1b** shows that the expenditure share of bad habits was higher than of education until 2010. Unfortunately, these costs each year has been steadily growing and reached more than 400 million in 2014. At first glance, expenditure per capita on bad habits appear to be small, but their total volume and dynamics are alarming.

If we consider that it is more to do with the increasing number of consumers than to the growth of consumption of these products per customer, the current situation is not a positive one.

As can be seen from **Fig. 2**, on the background of expenditures directed from the state budget on formation of human capital, the deductions from the family budget are very low.

Over these years, the funds allocated from the state budget on human capital formation accounted for a share of 90% to 96%. If there was not an informal amount of expenditure on education as well as on health care costs of the family budget, for a country that has taken on the liberal path of economic development, these figures could be considered as very high ones. However, despite the growth trend of expenditure allocated to education and health of the family budget, state budget expenditures in the total consumer spending is still quite large. However, if we assume that the informal expenditures of population are not reflected in official statistics, it is impossible to speak.

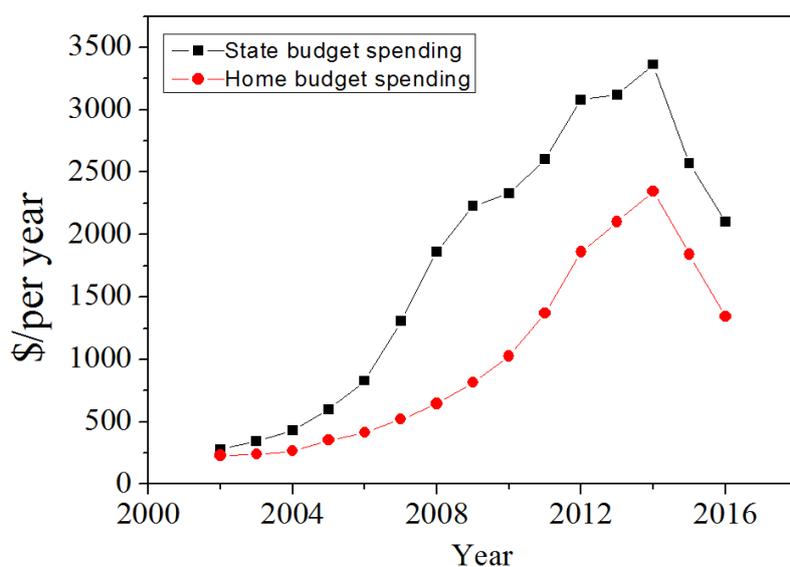


Fig. 2. Expenditures directed from the state budget on formation of human capital

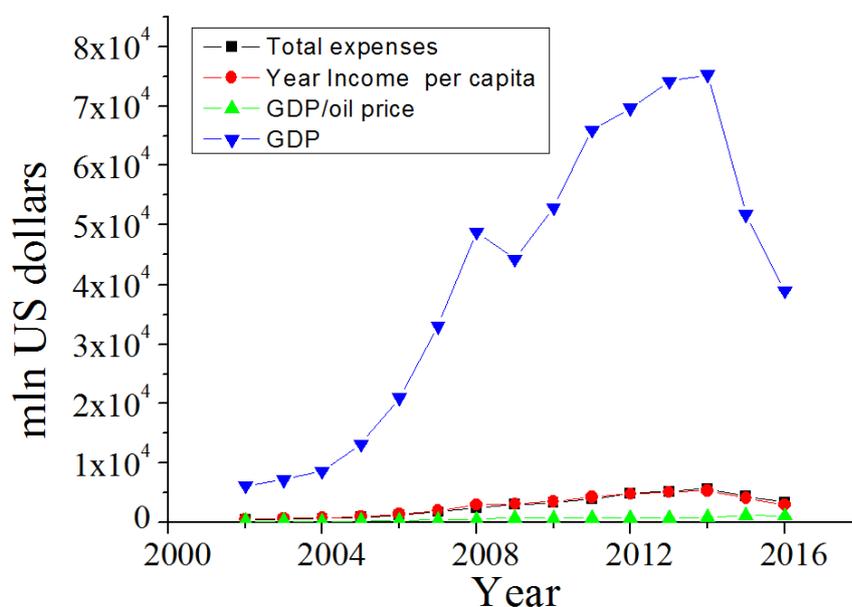


Fig. 3. Behavior of general human capital expenditures on GDP, GDP/oil price, level of poverty, and year income per capita

#### The Effect of State and Family Spending on GDP, GDP/oil price, Poverty Level, Year Income per Capita

In Analysis and assessment of interrelation of total expenditure of the state budget and the family budget on the formation and development of human capital in Azerbaijan with some macroeconomic indicators leads to the interesting conclusions. Fig. 3 shows the behavior of general human capital expenditures on GDP, GDP/oil price, level of poverty, and year income per capita.

Over the past 14 years, GDP has grown by about 10 times, but there is a drop in evidence since 2014, driven by a slide in oil prices. The poverty rate also fell by 10 times. In addition, income per capita and spending on human capital also increased by respectively 8 and 11 times. With the increase of government revenues and rising incomes of the population, the amount of funds allocated to education and health care has also increased. With the growth of total expenditure on human capital, poverty is reduced. Over the last 14 years the poverty rate decreased by 8 times in Azerbaijan. In 2003 the proportion of the population living below the national

**Table 1.** Pearson coefficient (r) of correlation between human capital expenditures and macroeconomic indicators

Expenses for human capital	GDP (mln US dollars)	GDP/oil price (mln US dollars)	Year Income per capita (US dollars)	Share of population below the national level of poverty, (%)
State budget spending, mln US dollars	0.9	0.81	0.95	-0.8
Home budget spending, mln US dollars	0.995	0.83	0.995	-0.92

poverty line in Azerbaijan was 49%. In 2016 this figure dropped to 5.3% (national statistical data). This was made possible as a result of the additional revenues generated by human capital, which is formed and develops due to the income generated in the country's budget (Hanushek 2013). **Fig. 3** shows that GDP is 4 times higher than the human capital expenditures. This indicates that the country is capable of following this line of development. **Table 1** shows a strong correlation between the state/family spendings on human capital and GDP ( $r = 0.995$  and  $r = 0.9$ , respectively). At the point, Strong correlation between human capital expenditures and GDP, as well as the indirect effect of human capital on TFP growth, was highlighted in (Fleisher et al. 2010).

On the one hand, GDP/oil price is lower than the human capital expenditures (**Fig. 3**). In fact, there is a strong correlation between GDP/oil price and human capital expenditures ( $r = 0.83$ ). However, this indicates that national economy of the Republic of Azerbaijan will be insecure without oil reserves. Accordingly, current human capital development will bring no benefit. Early studies show that countries with greater human capital grow their economies in a more rapid pace (Romer 1990). At this point, investment in education is a prerequisite for human capital formation that will generate ideas and promote the production of new products (Petraakis et al. 2002).

**Table 1** shows a fairly strong dependence of the total expenditure of the state budget and the budgets of the family on the population incomes ( $r = 0.99$ ). And it is not surprising. Because in recent years there were invested more in to the spheres of education and health, which are key factors in the formation and development of human capital. Repair or reconstruction of schools, providing health facilities with the new machinery and equipment are heavily dependent on GDP growth and incomes. So such a serious dependence on the background of lower oil prices and reducing of the oil export, and as a result of this reducing of oil revenues, could have a negative impact on the amount of funds allocated for the development of human capital. Because, as can be seen from **Table 1**, the overall cost of the development of human capital is in significant

correlation with household incomes ( $r = 0.95$ ). Consequently, the decline in these revenues will have a negative impact on all costs, aimed at developing human capital.

This problem and the opposite effect is expected between human capital and the level of poverty. There is a strong inverse interrelation between the level of poverty in Azerbaijan and state/family spendings ( $r = -0.92$ ;  $r = -0.85$ ). With the development of human capital the poverty is being reduced. Serious correlation between these two indicators and between total expenditure in human capital and GDP/oil Price, gives cause for concern. This concern is that the decline in oil revenues in the future could have a negative impact on the overall costs in human capital. If the investment aimed at the formation and development of human capital will be reduced, this could have a serious impact on the level of poverty. Therefore, it would be more appropriate to reduce the dependence of the volume of investments directed to the human capital from the oil revenues.

**Table 2** shows that the strongest relationship was in 2002 and 2004. It should be noted that the hypothesis about a 3-5-year return on investment in human capital is incorrect. Autocorrelation analysis shows that the return is immediate. The exception were the family spendings on human capital development in 2002 that returned in 2 years.

One can note that the main feature of the methods associated with the measurement of human capital, lies in the fact that one part of them is based on the costs, and the other part - on the revenues. The methods for measuring human capital, based on costs, envisaged the total expenditure spent on education, increasing knowledge and skills of the individual, as well as health and other spheres (Morris et al. 2017). The methods for measuring human capital, based on revenues, envisaged an income that can get individual, having education, certain knowledge and skills, and using these knowledge and skills. It should be noted that both methods used to calculate the human capital have certain disadvantages. They both do not envisage the quality of human capital (Flamholtz 2012, Wright and McMahan 2011).

**Table 2.** Autocorrelation data on human capital expenditures and GDP, GDP/ oil Price

Total expenses for human capital, mln US dollars	GDP (mln US dollars)	GDP/oilprice
2002	0.97	0.83
2003	0.98	0.79
2004	0.89	0.88
2005	0.82	0.86
2006	0.746	0.78
2007	0.645	0.69
2008	0.578	0.37
2009	0.268	0.028

It is also pertinent to point out that much of the motivation for human capital policies in developing countries is the possibility of providing economic growth that will raise the levels of incomes in these countries (Zhu & Li, 2017). The focus on alleviating poverty in developing countries relates directly to economic growth because of the realization that simply redistributing incomes and resources will not lead to long run solutions to poverty. Thus, the direct analysis of growth in developing countries adds a much more specific focus than has existed in much of the current policy discussions (Hanushek, 2013).

### CONCLUSION

In the analyzed period (2002-2016) the growth of oil revenues has had a significant impact on the entire economy and environmental conditions, including its social sphere. GDP growth has led to an increase in income of the population, and this, in turn, led to an increase in consumer spending and a gradual reduction of the poverty. With the increase of government revenues and rising incomes of the population, the amount of funds allocated to education and health care has been increased which is to the benefit of natural

ecosystem. There is a fairly strong dependence of the total expenditure of the state budget and the budgets of the family on the formation and development of human capital from the population incomes ( $r=0.995$  and  $r=0.94$  respectively). As we found out, GDP / oil price figure is lower than the cost of human capital development. On the other hand, there is a strong correlation between the GDP / oil price and human capital expenditures ( $r = 0.83$ ). This result shows that countries with potential for oil production will fail to develop human capital without oil reserves existing in nature.

Autocorrelation ecological analysis shows that investments in human capital return immediately, except for the family spendings on human capital development in 2002 that returned in 2 years.

There is a strong inverse interrelation between the level of poverty in Azerbaijan and total expenditure in human capital per capita ( $r=-0.92$ ). With the growth of total expenditure on human capital, poverty is reduced which is useful for natural environment of country.

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