Scientific and Educational Challenges in Georgia and Its Economy

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Abstract: The most significant aspect of the current study is represented by the fact that it closely analyses the most influential variable education and its effect on the Georgian economy. Thus, the essence of the problem is mainly originated from the current state of the Georgian education system, alongside with the level and the scale of government participation towards science development. Consequently, identified challenges and given recommendations can be much more fruitful not only for the development of the long-term scientific policy in Georgia, but also for the strategic improvement of the country's general economic and educational attitudes.

Accordingly, the paper initially implies the Bibliometric methodology that includes a combination of text and information study-measurement approach, in which the indicators are used to assess and analyze scientific domains. Moreover, by using citation, contextual and graphical analyses it provides the best country selection process for research purposes.

More importantly, the current study shows that while **the Pre-primary and primary education** (GFS code 7091, ISCED-97 level 0 and ISCED-97 level 1) expenditure is considered vital for all study participating countries, the Georgian state budget for education does not provide any funds towards mentioned component. The study also found that compared to other six research involved nations, the Georgian authority attributes significant funds towards **the Secondary education** (GFS code 7092, ISCED-97 level 2 and ISCED-97 level 3) expenditure component. Whereas, according to the latest international research findings this is the segment where Georgia underperforms most.

The third major problem identified during the study is high level of spending associated with **the Education not elsewhere Classified** (GFS code 7098) expenditure component, so called bureaucratic costs, which are growing at a colossal rate and, according to 2017 data, it accounts about 25% of total education expenditures.

More importantly, the paper targets not only those authorities whose prime goal is to allocate funds and establish specific educational policies, but it closely touches representatives of academic field by indicating those problematic issues towards which educational institutions must work and be striving to accomplish.

Crucially, the results of current research widely assist in identification of the necessary trends needed to detect and pay close attention on the Georgian educational issues and to consider the practice of foreign successful analogues and provides several recommendations on that matter.

Keywords: Georgia, Budget, Fiscal policy, Expenditure, GDP, Economy, Education, Science, Bibliometry.

Introduction

> „In the long run, economic growth comes not from cramming more horses onto your island, or more factories into your rust belt, or even more information onto your servers, but from technological breakthroughs—not from more of the same but from the new and previously unthinkable".
>
> *Steven E. Landsburg*

The word "Science" comes from the Latin word "Scientia" and refers to knowledge. Moreover, as noted in the book (Neal et al. 2008), the term "Science" can be used in two ways: first, as a process that involves the attainment of knowledge and second, as an acquired knowledge. In addition, as the authors point out, science is a synthesis of the truth searching and discovery of novelty, in where objectivity and a systematic approaches are considered to be the main point of truth-seeking. Furthermore, it embraces and maintains standard modeling, methods, statistical analysis, controlled experiments and replications. Moreover, the main goal of the science is to better understand and explain the world in which we exist, using some rational and probability models.

Given that the efficiency of the education sector and scientific achievements are representing a cornerstone of any country's economy, which is mainly due to its multifunctionality, it is important to analyze the Georgian education system and applied strategies, alongside with the existing examples of the leading European approaches.

One of the most prominent in the field of science is The United Kingdom. Where the relationship between government and science has been around for quite some time, and it dates back to about the first half of the 20th century, when heavy dependance on German industrial products was identified as threat. Since then, this relationship has gone through many stages, and the most important was in 1993, when the science and technology development policy was adopted. This policy, based on the principles of science and

engineering, developed the need for priority selection of industries that would primarily be focused on national wealth creation (Keenan et al 1998)..

Germany is one of the world's largest research and development (R&D) orientated economy. Which fully embraces itself in a high-quality R&D policy and combines fundamental research, applied research, and experimental directions with the variety comprehensive disciplines. Furthermore, the success of the German system depends on many complex parameters and factors, and the skeleton of this system is determined by the country's federal structure, the size of the economy and sectoral focus, and the diversity of its numerous players (Federal Report on Research and Innovation 2018).

Worldwide, there are many ways to evaluate the results of scientific policy, but the Netherlands by all standards ranks high everywhere, especially when country's scarcity and the amount of money spent on science development is taken account. It is important to analyze how such small country managed to accumulate so much research power. Firstly, the location plays a big role,alongside with systematic investments in infrastructural and technological projects. In addition, the culture of openness and directness, cooperativness, organizational and avoidance of a strictly defined bureaucratic-hierarchical structure, played a major role in achieving the global success (Van Dijck et al. 2017).

In 2013, the Czech Republic approved one of the most important document concerning the Research-Development-Innovation Policy, which was later disseminated across the country and included core reform programs for 2014-2015. Additionally, the most fundamental change towards research and innovation policy was the creation of a National Research and Innovation Strategy based on the specific specialized needs for the Czech Republic. The main goal of this strategy was to effectively target European, national, regional and private funds, which would further consolidate national and regional knowledge and would be used to strengthen research and development capabilities, which could ultimately reduce unemployment and strengthen the country's competitiveness. In addition, two programs have been implemented to support the needs of the industry: first, the so-called EPSILON program, which was focusing on applied research and the implementation of experimental research in collaboration with the Czech Agency for Technology, and the second, creation of under the responsibility of the Czech Ministry of Industry and Trade, supporting Research and Development programs known as TRIO (Government of the Czech Republic. 2016).

Georgia in the field of scientific research is mainly represented by the following eight research institutions: LEPL Shota Rustaveli National Science Foundation; LEPL Georgian National Academy of Sciences; LEPL Georgian Academy of Agricultural Sciences; LEPL Ivane Beritashvili Experimental Biomedicine Center; LEPL Cornel Kekelidze Georgian National Center of Manuscripts; LEPL Giorgi Eliava Scientific Research Institute of Bacteriophage, Microbiology and Virology; Ivane Javakhishvili Tbilisi State University; LEPL Georgian Technical University and LEPL Ilia State University; Aditionally, in 2017 based on the data obtaind from the Georgian Ministry of Education, a total of 63 million GEL was allocated to the above-

mentioned organizations. From which, 50% of the fund went to Shota Rustaveli National Science Foundation. Approximately 17.4% was allocated to Ivane Javakhishvili Tbilisi State University, while the rest was distributed to remaining six research institutions.

Problem Identification

Currently, the numerous empirical papers indicate that the growing economic strength of any country is directly affected on the population prosperity. Moreover, countries characterized with high rates of production are demonstrating faster economic growth and, consequently, fairly distributing accumulated national wealth amongst all segments of the population. Which in terms leads to ultimate formation of the nation's identical individualism as a whole.

Crucially, the task of maintaining a high rate of production growth is constantly associated with challenges and are faced with numerous internal or external factors. Moreover, in today's rapidly changing world, it is vital to regularly create or develop a products that will primarily be focused on enhancing country's productivity and attaining its competitiveness.

Thus, the essence of the problem is mainly originated from the current state of the Georgian education system, alongside with the level and the scale of government participation towards science development. As mentioned previously, the economic growth of a particular country and therefore the achieving the high level of production is largely relied on the level of innovation, how developed science is in the country and what are the focal approaches towards science policy?

If we closely look at below **graph 1**, which was extracted from **Scimago Journal & Country Rank (SJR)** powered by **Scopus**, we clearly see that Georgia is in depraved situation.
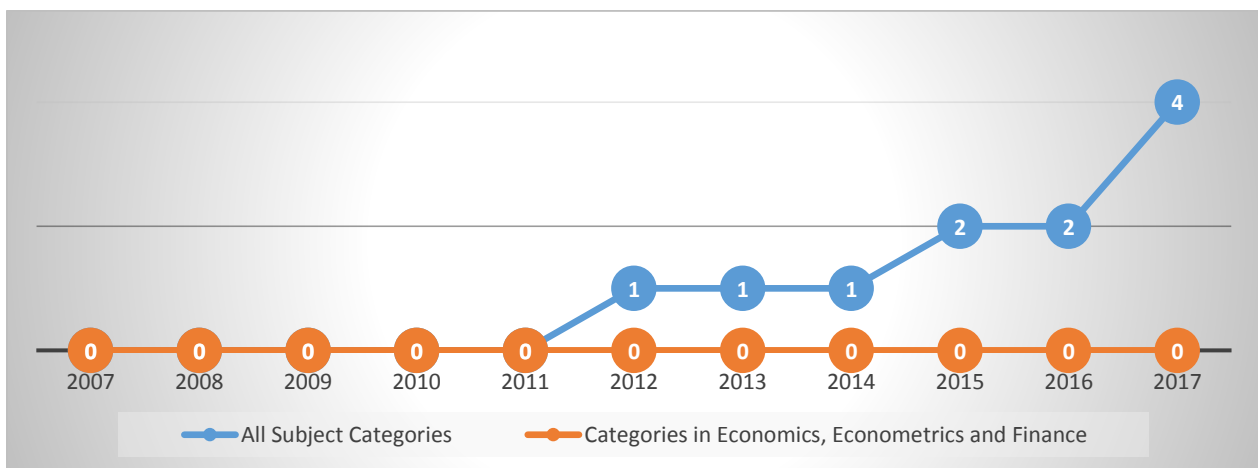

Graph 1: Quantitative distribution of the published Georgian magazines

Moreover, as we can clearly see, all time high number of four Georgian registered magazines, in all subject categories, is present in the year of 2017 and sadly by taking account the prestige of the journal, amongst listed four magazine, only one felt in third percentile by accumulating seven citing on the H citation index. Unfortunately, the remaining other three magazine were falling into the last fourth percentile, with a minimal citation marks on same H index. Furthermore, the situation is even more deplorable according to the social science disciplines of economics, econometrics and finance, where Georgia is not represented at all with any journal.

Research Significance

The importance of this study is outlined by the fact that it addresses the previously identified problem in a broader context. In particular, the study examines the involvement of the state expenditure on education, as one of the main influential indicator on economic development, by closely analyzing six Western and Eastern European countries (United Kingdom, Netherlands, Germany, Czech Republic, Poland, Lithuania) analogues and comparing it to the Georgian education system by implying the functional classifications of state budget expenditure and non-financial assets eight universal subcomponents, outlined by International Monetary Fund's Government Finance Statistics 2014 manual.

It is important that above listed countries are selected based on their success in publication and citation rate. Particularly, the study uses those Western and Eastern European published journals quantities that were represented initial fifty (1-50) representation rankings, as in all subject areas also in the fields of economics, econometrics and finance (for details please see **Figure 2-5**).
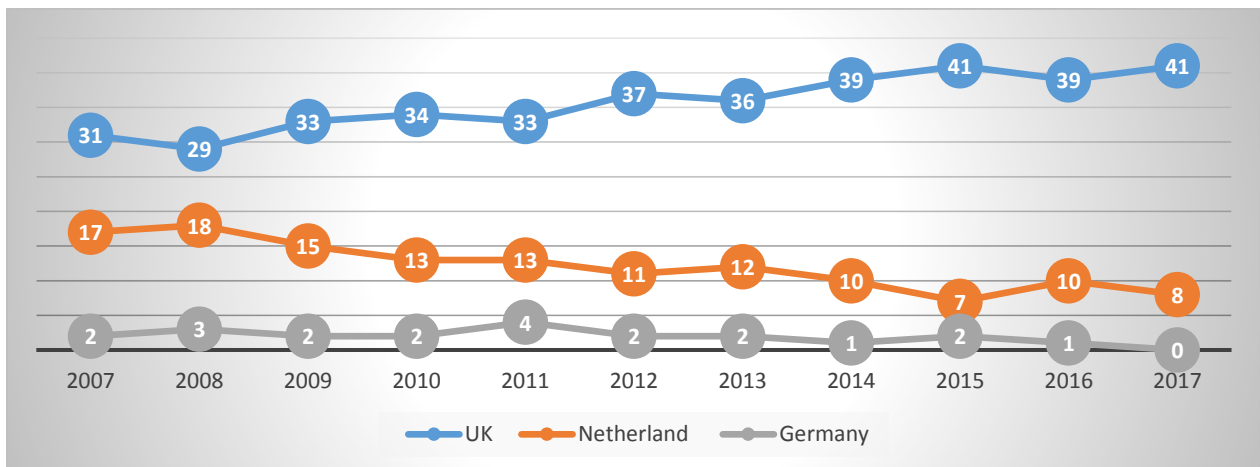
Graph 2: Western European journal quantities in all subject categories (1-50)
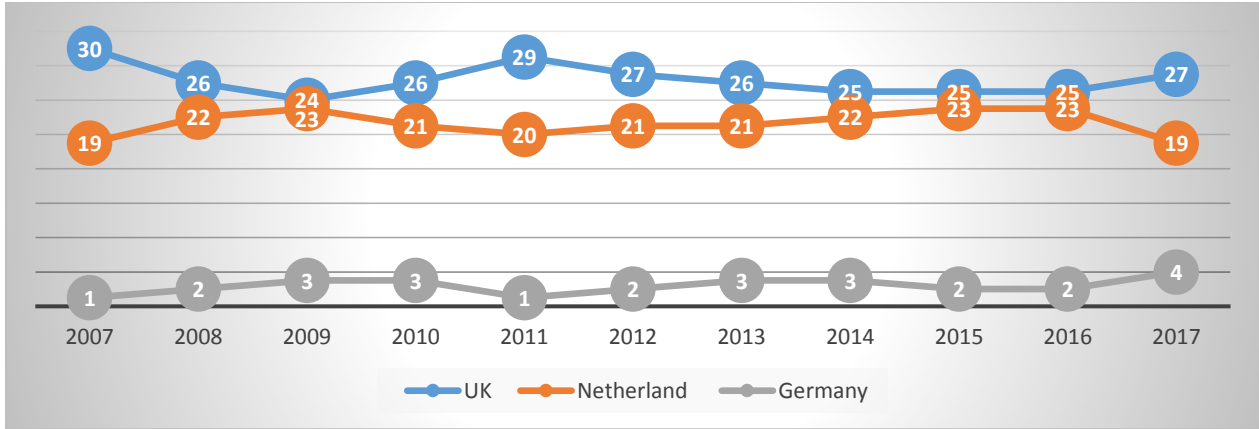
Graph 3: Western European journal quantities in the subjects of economics, econometrics and finance (1-50)
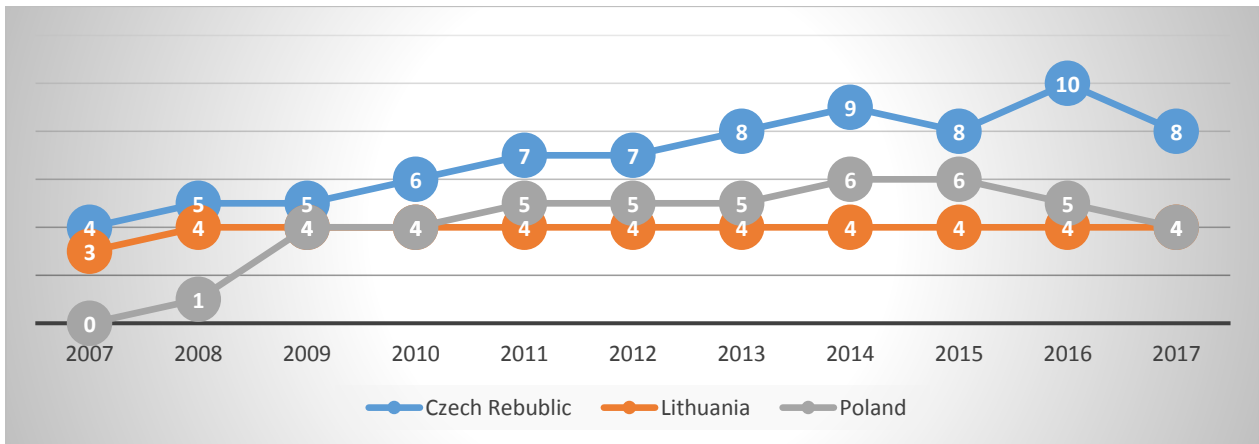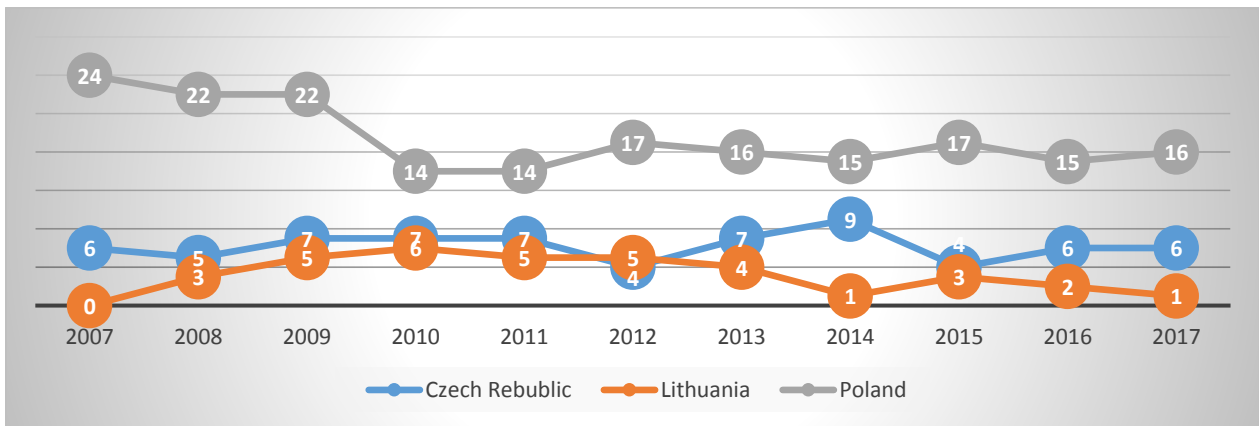

Graph 4: Eastern European journal quantities in all subject categories (1-50)

Graph 5: Eastern European journal quantities in the subjects of economics, econometrics and finance (1-50)

Moreover, the results of current research will widely assist in identification of the necessary trends needed to detect and pay close attention on the educational issues and to consider the practice of foreign successful analogues. Thus, identified challenges can be much more prolific not only for the development of the long-term scientific policy in Georgia, but also for the strategic improvement of a country's general economic and education attitudes.

More importantly, the paper targets not only those authorities whose prime goal is to allocate funds and establish specific educational policies, but it closely touches representatives of academic field by indicating those problematic issues towards which educational institutions must work and be striving to accomplish. Thus, current study could be reviewed as conjunctional Bridge between policy and academic paper as in practice, especially in the fields of education, decisions made by political authorities widely effects on economic growth and on educational system and vice a versa.

Research Method

Accordingly, the paper initially implies the Bibliometric methodology that includes a combination of text and information study-measurement approach, in which the indicators are used to assess and analyze scientific domains. Moreover, by using citation and contextual analysis it provides best country selection process for research purposes.

The second stage of study relies on data of the International Monetary Fund's (2014 year) manual on Government Finance Statistics, particularly maintaining Governments expenditures and change in non-financial assets on education, including expenditure on services provided to individual pupils/students and expenditure on services provided on a collective basis. Thus, Expenditure on individual services is allocated to groups (7091) through (7096). However, expenditure on collective services is assigned to groups (7097) and (7098).

Furthermore, on its essence these eight subcomponents, particularly 1-5 classifiers referring to levels of education and 6-8 broad groups and fields of education, are universal for all countries as it is based on United Nations Educational, Scientific And Cultural Organization's manual and are differentiated based on International Standard Classification of Education's (ISCED) level. What is more, the Educational programmes are cross-classified by levels and fields of education, each variable being independent. Thus, every educational programme can be classified into one and only one cell in the level-field matrix. Obviously, not every combination of level and field exists, or can exist (ISCED, 2006 Re-edition).

Thus, first type of Cross-classification variable implies:

1. Pre-primary and primary education (ISCED-97 level 0 early childhood education and ISCED-97 level 1 Primary Education).

2. Secondary education (ISCED-97 level 2 Lower Secondary Education and ISCED-97 level 3 Upper Secondary Education).

3. Postsecondary non-tertiary education (ISCED-97 level 4 Post-secondary non-Tertiary Education).

4. Tertiary education (ISCED-97 level 5 Short-cycle tertiary education and ISCED-97 level 6 Bachelor's degree or equivalent tertiary education).

5. Education not definable by level (ISCED-97 level 7 Master's degree or equivalent tertiary education and ISCED-97 level 8 Doctoral degree or equivalent tertiary education).

Second type of Cross-classification variable implies:

6. Subsidiary services to education.

7. R&D Education.

8. Education not elsewhere classified.

The third stage of study relies on data of the World Economic Forum's Global Competitiveness Index that is mainly based on twelve defining pillars and includes many detailed factors and indicators of world's numerous countries. Moreover, the study provides a comparative graphical analysis between Georgia and above listed European countries, on the (1-7 best) quality assessment scale based on following indicators: Quality of the education system, Quality of primary education, Quality of scientific research institutions, University-industry collaboration in Research & Development, Availability of scientists and engineers and Company spending on Research & Development.

The final stage of the study, after the data is being retrieved from prestigious sources, such as: the Scopus Database, Eurostat, the Ministry of Finance of Georgia and the Global Economic Forum's Global Competitiveness Index databases, the result are graphically processed using Microsoft Excel Software. What is more, the fundamental data analysis is widely implies data graphical analyzing techniques and comparing comparatively widely validated data over the period of 2007-2017 years.

Analyzing research results

Before, we go in-depth analyse of the obtained data, it is important to know how much fund is directed by the study participating countries toward national education systems. Analysis of **Graph 6** shows that education expenditure, in relation to Gross Domestic Product, is much lower in Georgia and it approximates around 3% mark, while in the case of the other six nations same mark ranges on average around 5% mark.
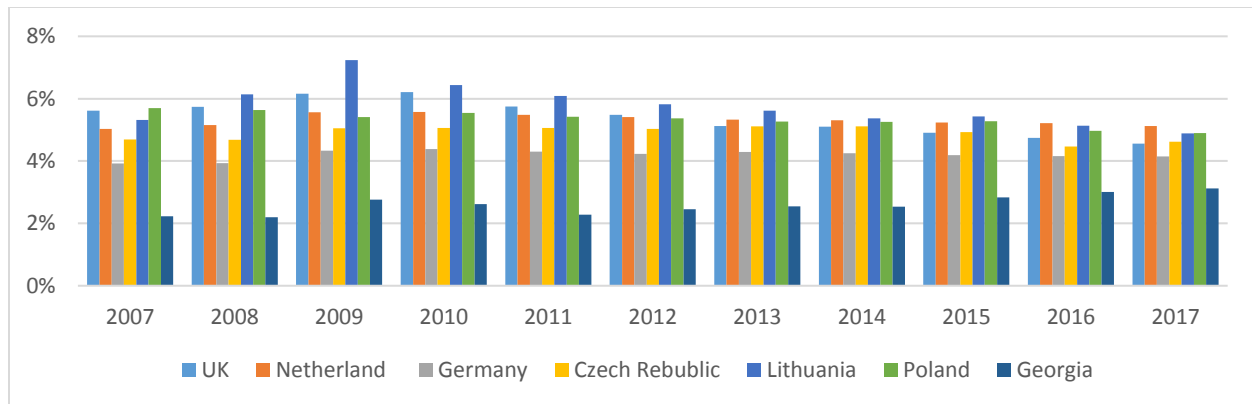
Graph 6: Share of Education in GDP

Conserning, the share of education expenditure in total budget expenditures (for details please see **Figure 7**), Georgia, until 2015, had been represented at the last place. However, the growth rate in 2016 and 2017 is more than Germany, but if we consider in detail the reasons, not taking into account the impressive amount of budget funding on education by Germany, it is mainly due to the relatively small rise in education spending in both years 3%, compared to total budget expenditures increase of 4%.
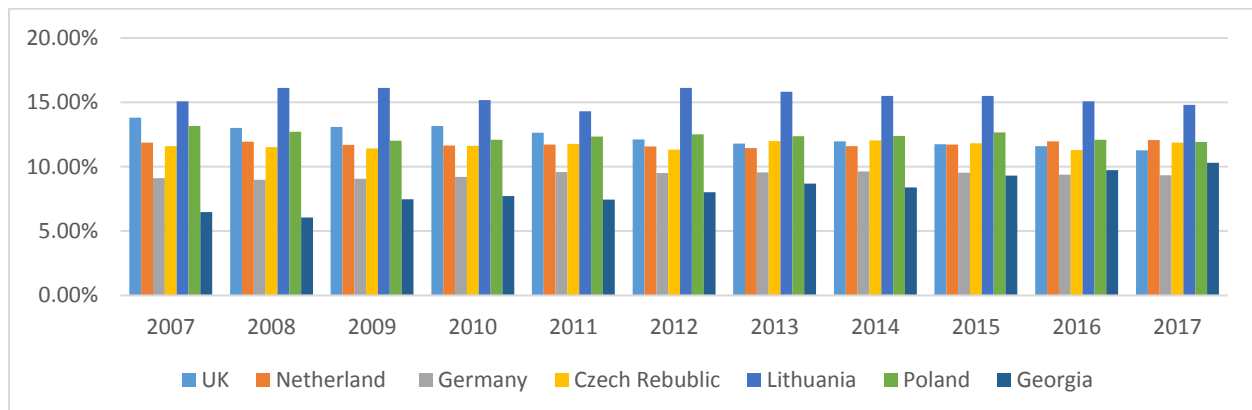
Graph 7: Share of Education in Total Budget Expenditure

Furthermore, while most of the countries involved in the study pay significant amount to the first budget expenditure component of **the Pre-primary and primary education** (GFS code 7091, ISCED-97 level 0 and ISCED-97 level 1), interestingly, for Georgia mentioned component is considered as insignificant, associated with zero funding. On the contrary, remaining countries take it very seriously, for example same component

in Poland and the Netherlands, on average amounts to 34% and 32% of total educational budget over the ten year period. **See Appendix A, Table 1 for details.**

On the other hand, when we closely review the cost redistribution of the next indicator **Secondary Education** a radically different approach is observed. Despite the fact that expenditure component has declining trend over the last three years, it still shows higher than all the participant countries and stands on average of 64% of total educational expenditure. On the contrary, same component does not represent more than 40% on average, in any country. **See Appendix A, Table 2 for details.**

Regarding, the third component of the **Postsecondary Nontertiary Education** the UK, with spending on average of 10.13%, is the leader. Lithuania and Georgia are on the second and third places with 3% and 2.4%, respectively. Germany accounts for about 1.6% of this classification. And other countries spend around 1%, except for the Netherlands, which does not apply any funds toward this component. **See Appendix A, Table 3 for details.**

Georgia by spending on **Tertiary Education** ranks 6th with an average of 13% fund allocation. Poland and the Netherlands are the leaders in this classification by spending 27% and 25% of total expenditures. All other remaining countries fluctuate around 20% mark, except for the United Kingdom, which ranks last place with about 10% spending, but with an expenditure inclining trend. **See Appendix A, Table 4 for details.**

From the Georgian perspective the fifth component of **Education not Definable by Level** does not fall in essential expenditure classifier as zero fund is attributed toward it, over the ten year period. Concerning others, the United Kingdom, Lithuania and Poland are leading the list by spending on average of 8%, 6% and 4% respectively. As for the other three remaining countries, their average share in total educational expenditure fluctuates around 2%. **See Appendix A, Table 5 for details**.

First of all, it is important to clarify what the given sixth **Subsidiary Services Expenditure** component maintains. According to International Monetary Fund's (2014 year) manual on Government Finance Statistics the following cost allocation address, at any level active students, following cost structures: Provision of subsidiary services to education; Administration; inspection; Operation or support of transportation; Food; Lodging; Medical and dental care and related subsidiary services chiefly for students regardless of level. Moving forward, it is important to note that the current expenditure component regarding to Georgia stood at around 4% mark during 2007-2012 years. Surprisingly, in 2013-2014 the funds in this direction were not distributed at all. However, for the period of 2015-2017 it has increased dramatically to an average level of 7.2%. In general, Germany leads the classification with 8% mark, followed by the Czech Republic and Poland with an average mark of 5%. **See Appendix A, Table 6 for details.**

The seventh **R&D in Education** expenditure classifier was virtually ignored until 2012 in Georgia. However, in 2013-2017, its share in total expenditures mounted to 6% on average. As for other participating countries, this expenditure component is mainly favored by Eastern European countries, as the Czech Republic and Lithuania spending on average 15% and 9% respectively. As for other countries, their average cost level is below the 1% mark. **See Appendix A, Table 7 for details.**

Before moving to close analyses of final eighth expenditure component **Education not elsewhere Classified**, as was in case of Subsidiary Services Expenditure component, it is important to explain what a given expenditure component contains. Similarly, according to International Monetary Fund's (2014 year) manual on Government Finance Statistics the mentioned cost allocation maintains following: Administration, operation, or support of activities such as formulation, administration, coordination, and monitoring of overall educational policies, plans, programs, and budgets; Preparation and enforcement of legislation and standards for the provision of education, including licensing of educational establishments; Production and dissemination of general information, technical documentation, and statistics on education. This spending component, in other words bureaucratic costs, is the highest in Georgia. For example, if its rate in the years of 2007-2014 was 10.7% on average, representing already high value compare to other countries, has increased dramatically following three years of the study period and averaged at 21%, of which dramatic increase was seen in 2017 were it indicated all time high almost 25% mark.

As for the other participating countries, Lithuania and the United Kingdom lead in this expenditure classification with 8% and 7% respectively. Concerning, the allocation costs of the other four countries there expenditures are less than 1.5% of the total educational budget allocations. Amongst them is mostly noticeable the Netherlands which spends only 0.32% on bureaucracy. Please **See Appendix A, Table 8 for details**.

Further analyses of The World Economic Forum's Global Competitiveness Index

Mentioned index is based on twelve defining pillars and includes many detailed factors and indicators of world's numerous countries. However, for research purposes, we are only focusing on indicators that are primarily related to education and science.

First relevant indicators for current study is **Quality of the education system**. If we closely analyze the component, we clearly see that Georgia constantly holds last place over the research period. For example, according to 2017-2018 year data, Georgia by Quality of the education system stood at 107 place out of 143 participating countries. Concerning other participating countries, the Dutch education system is impressive, closely followed by Germany and the United Kingdom. **See Appendix B, Graph 8 for details**.

Not surprisingly similar trend is identified when reviewing the second indicator the **Quality of Primary education**. Still if we closely look at the following indicator, Georgia's rate remains almost identical to the Quality of the education system. Additionally, as previously Georgia ranks last among other study participant countries and holds 106th place on world scale. What is more, the Quality of Primary education in Georgia is being showing stagnant or deteriorating trend over the research period. As for other counties, the Netherlands is still in the first place, followed by Germany and the United Kingdom holding second and third place. Remaining three countries also possess promising positions and firmly identifying themselves in the best fifties range among 147 participants. **See Appendix B, Graph 9 for details**.

In order to have much more clear picture, it is beneficial to review the third and fourth indicators, the **Quality of scientific research institutions** and the **University-industry collaboration in Research & Development**, in unity. Both component's graphical analyze demonstrates catastrophic results. For example assigned score for the Quality of scientific research institutions dropped from 3.13 in 2007-2008 year period to 2.68 in 2017-2018 year, which is 1.5 points less than Poland that holds second to last place on the list in 2017-2018 year. Thus, it should not come as a surprise that the identified result had immense reflection on the University-industry collaboration in Research & Development, which in fact should be the cradle for future scientist, where virtually no positive shifts are observed and Georgia is still represented on the last place. Concerning other participants, the UK, The Netherlands and Germany were presented on the leading side, followed by Czech Republic, Lithuania and Poland. **See Appendix B, Graph 10-11 for details.**

Not surprisingly, the fifth indicator, the **Availability of scientists and engineers**, could be viewed as outcome of previous unfortunate trends for Georgia leading in reduction of qualified science and engineers capacities, which may also include the dramatic outflow of professionals from the country. As for the results of other participant countries, all of them showed quite remarkable marks holding above the 4-point mark, except for the Czech Republic which recorded a dramatic decline from 2007-2008 period, particularly indicating sharp fall last two years of the research period. **See Appendix B, Graph 12 for details**.

The last indicator is represented by the **Company spending on Research & Development**. Mentioned component clearly represents the culmination and reflection towards a trust and approach private companies have towards education system and science policy in Georgia. Thus, graphical analyze showed that Georgian companies had spent least amount in research and development. On the contrary, first place were hold by industrialized Germany. The second and third place is divided between the United Kingdom and the Netherlands. Concerning, the Czech Republic, Lithuania and Poland they share next places in a similar sequence. **See Appendix B, Graph 13 for details**.

Research findings

For developing country like Georgia, and not only, is very important that state decision making bodies be involved in the implementation and development of the country's education strategy and science policy at any level. It is also noteworthy that any resources, accumulated at the expense of taxpayers, should be effectively and optimally directed towards enhancement of the level of science and education in general. Therefore, in most countries, it is the state that maintains the responsibility and crucial role for accelerating positive charges, which in many terms is a powerful foundation for the future independent development for educational and scientific progression.

More importantly, the current study shows that while Pre-primary and primary education is considered vital for all study participating countries, the Georgian state budget for education purpose does not provide any funds towards same component and is simply left to incompetents'.

The study also found that compared to other nations, the Georgian authority is attributing significant funds towards the Secondary education expenditure component. Whereas, according to the latest international research findings this is the segment where Georgian education system underperforms most.

The third major problem identified during the study is high level of spending associated with the Education not elsewhere Classified expence component, so called bureaucratic costs, which are growing at a colossal rate and, according to 2017 data, it account for about 25% of total education expenditure.

Additionally, it is worth noting that today's deplorable result, in which Georgian educational system is, widely defends on inefficient state budget allocation. In particular, the problem much clearly and painfully is visible whilst analyzed key components based on data obtained from the Global Competitiveness Index of the World Economic Forum (Quality of the education system; Quality of primary education; Quality of scientific research institutions; University-industry collaboration in Research & Development; Availability of scientists and engineers; Company spending on Research & Development), where Georgia is an outsider and underperforms significantly. However, only blaming state authority and inefficient budget allocation would be unjustifiable as its Georgian academic sphere needs to be revitalized and be more research orientated, not only from students' perspective but crucially from the academic field.

Recommendations

It is impossible to have any economic strength if it is not based on a solid foundation. It is also impossible to have a solid education system and high quality researchers, if we do not take care of future generations and their proper educational upbringing from the very beginning. Importantly, fact is that if the given quality of education and science is to be rejuvenated, it is simply wrong to discuss them in individual isolated terms, as it requires a comprehensive approach and must be preceded alongside with the development and enhancement of the high-technological, legal and infrastructural bases. Thus, this automatically implies high levels of close cooperation amongst all government and academic structural entities.

More importantly, the paper targets not only those authorities whose prime goal is to allocate funds and establish specific educational policies, but it closely touches representatives of academic field by indicating those problematic issues towards which educational institutions must work and be striving to accomplish.

Thus, in order to enhance the effectiveness of future Georgian educational system, the research is introducing a number of recommendations:

- ✓ **It is recommended to study the Pre-primary and primary education cost system based on foreign analogues and to allocate budget funds on that component according to the relevant strategic plan;**

- ✓ **It is recommended to ivestigate thoroughly the allocayions of the colossal funds on the Secondary education and the released funds be directed to Pre-primary and primary education;**

- ✓ **It is recommended that Education not elsewhere Classified expenditure component be studied meticulously and released funds to be redistributed towards the Postsecondary non-tertiary Education and Education not Definable by Level, which are the cradles for future engineers and researchers;**

- ✓ **It is highly recommended that Georgian academic sphere be revitalized and be more research orientated. Thus, relentless attention should be paid improvements and constant developments of the indicators of: Quality of scientific research institutions, University-industry collaboration in Research & Development and Availability of scientists and engineers.**

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Appendix A (Sub-classification Codes' 7091-7098 as share in Total Education Expenditure)

Year	UK	Netherland	Germany	Czech Republic	Lithuania	Poland	Georgia
2007	29.26%	32.15%	25.88%	8.96%	18.37%	33.33%	0.00%
2008	28.60%	32.36%	26.24%	20.62%	16.39%	33.37%	0.00%
2009	28.39%	32.15%	25.86%	21.42%	17.73%	33.75%	0.00%
2010	28.45%	32.57%	26.51%	21.59%	14.74%	33.62%	0.00%
2011	28.57%	32.30%	26.80%	21.07%	14.43%	32.91%	0.00%
2012	26.92%	31.83%	27.40%	20.92%	13.83%	33.17%	0.00%
2013	26.41%	31.49%	28.47%	21.23%	14.09%	34.02%	0.00%
2014	24.71%	31.54%	28.78%	20.39%	14.68%	34.05%	0.00%
2015	24.64%	30.53%	29.27%	20.50%	15.61%	33.12%	0.00%
2016	24.90%	29.79%	29.95%	21.53%	17.92%	35.37%	0.00%
2017	23.50%	29.63%	30.38%	21.87%	18.44%	37.90%	0.00%

Table 1: Pre-primary and primary education (Sub-classification code 7091)

Year	UK	Netherland	Germany	Czech Republic	Lithuania	Poland	Georgia
2007	29.56%	40.17%	43.01%	51.05%	41.75%	27.39%	76.23%
2008	29.67%	38.98%	42.41%	41.01%	40.36%	27.04%	75.21%
2009	30.48%	38.72%	39.37%	40.45%	42.68%	28.36%	64.35%
2010	31.24%	39.09%	39.06%	39.07%	42.57%	28.51%	64.72%
2011	33.50%	38.83%	38.31%	40.07%	40.92%	27.84%	70.81%
2012	35.91%	38.92%	38.09%	37.34%	37.83%	27.80%	70.43%
2013	39.95%	39.00%	37.47%	36.26%	34.01%	27.40%	65.15%
2014	43.49%	40.17%	37.27%	37.79%	33.64%	26.48%	70.46%
2015	43.99%	40.20%	37.07%	38.20%	33.95%	26.81%	48.64%
2016	47.74%	40.60%	37.17%	38.45%	35.56%	28.37%	51.14%
2017	47.19%	40.46%	37.22%	38.95%	35.25%	26.75%	49.38%

Table 2: Secondary education (Sub-classification code 7092)

Year	UK	Netherland	Germany	Czech Republic	Lithuania	Poland	Georgia
2007	11.61%	0.00%	1.69%	0.04%	0.90%	0.09%	4.05%
2008	9.96%	0.00%	1.68%	0.42%	0.80%	0.12%	3.17%
2009	10.63%	0.00%	1.67%	0.45%	0.87%	0.14%	2.22%
2010	11.28%	0.00%	1.61%	0.45%	1.77%	0.03%	1.97%
2011	10.91%	0.00%	1.61%	0.43%	1.71%	0.03%	1.17%
2012	11.40%	0.00%	1.61%	0.43%	1.77%	0.04%	1.45%
2013	10.52%	0.00%	1.56%	0.59%	4.57%	0.02%	1.36%
2014	9.32%	0.00%	1.52%	0.42%	4.56%	0.03%	2.02%
2015	9.11%	0.00%	1.50%	0.44%	4.63%	0.01%	3.14%
2016	8.84%	0.00%	1.49%	0.46%	5.22%	0.01%	2.54%
2017	7.90%	0.00%	1.49%	0.45%	5.16%	0.00%	3.03%

Table 3: Postsecondary non-tertiary education (Sub-classification code 7093)

Year	UK	Netherland	Germany	Czech Republic	Lithuania	Poland	Georgia
2007	11.16%	23.48%	20.62%	17.60%	19.90%	28.70%	12.62%
2008	12.48%	24.29%	20.53%	16.56%	18.32%	28.03%	12.50%
2009	12.91%	24.39%	20.31%	15.66%	17.61%	26.04%	14.90%
2010	12.33%	23.61%	20.19%	16.12%	18.39%	26.26%	13.57%
2011	10.69%	24.22%	20.66%	17.90%	16.27%	27.99%	11.09%
2012	11.67%	24.92%	20.14%	18.62%	23.68%	27.48%	10.64%
2013	9.64%	25.44%	20.31%	18.17%	21.61%	26.76%	14.78%
2014	9.17%	25.23%	20.34%	17.52%	22.77%	27.90%	11.89%
2015	6.95%	26.36%	20.34%	16.16%	22.22%	27.82%	13.70%
2016	4.67%	26.81%	19.15%	15.04%	16.28%	24.81%	13.59%
2017	5.61%	27.12%	18.67%	14.01%	14.97%	24.35%	10.83%

Table 4: Tertiary education (Sub-classification code 7094)

Year	UK	Netherland	Germany	Czech Republic	Lithuania	Poland	Georgia
2007	10.48%	0.74%	2.99%	2.53%	5.55%	4.99%	0.08%
2008	10.38%	0.87%	3.03%	0.96%	5.06%	5.28%	0.03%

2009	9.20%	0.95%	2.87%	1.22%	5.69%	5.20%	0.03%
2010	8.46%	1.05%	2.45%	1.87%	6.51%	4.77%	0.00%
2011	8.46%	1.09%	2.38%	1.77%	6.29%	4.33%	0.03%
2012	7.64%	1.06%	2.29%	1.78%	6.00%	4.40%	0.00%
2013	7.12%	0.92%	2.21%	2.08%	6.06%	4.41%	0.00%
2014	6.87%	0.00%	2.17%	1.71%	6.09%	4.25%	0.00%
2015	7.10%	0.01%	2.15%	1.90%	6.63%	3.81%	0.03%
2016	6.93%	0.00%	2.21%	1.91%	7.32%	2.89%	0.19%
2017	7.10%	0.00%	2.27%	1.88%	7.51%	2.14%	0.13%

Table 5: Education not definable by level (Sub-classification code7095)

Year	UK	Netherland	Germany	Czech Republic	Lithuania	Poland	Georgia
2007	0.49%	2.83%	4.26%	6.27%	0.94%	3.84%	3.28%
2008	0.90%	2.77%	4.57%	5.93%	0.91%	4.24%	4.27%
2009	1.28%	2.82%	8.42%	5.85%	0.95%	4.48%	5.61%
2010	1.33%	2.75%	8.72%	5.49%	1.04%	4.82%	5.77%
2011	0.97%	2.63%	8.87%	5.05%	1.03%	4.98%	4.06%
2012	0.61%	2.54%	9.08%	5.64%	0.82%	5.15%	2.77%
2013	0.56%	2.46%	8.69%	4.77%	0.75%	5.27%	0.00%
2014	0.63%	2.41%	8.66%	4.61%	0.86%	5.31%	0.00%
2015	0.60%	2.27%	8.43%	4.35%	0.82%	5.27%	7.80%
2016	0.56%	2.34%	8.67%	4.37%	0.85%	5.60%	7.36%
2017	0.61%	2.32%	8.61%	4.44%	0.72%	5.58%	6.45%

Table 6: Subsidiary services to education (Sub-classification code 7096)

Year	UK	Netherland	Germany	Czech Republic	Lithuania	Poland	Georgia
2007	0.09%	0.34%	0.22%	12.64%	3.78%	0.45%	0.00%
2008	0.04%	0.35%	0.22%	13.29%	10.22%	0.61%	0.00%
2009	0.03%	0.35%	0.23%	13.58%	9.97%	0.62%	0.01%
2010	0.02%	0.36%	0.24%	14.05%	8.56%	0.62%	0.00%
2011	0.01%	0.39%	0.23%	12.38%	7.75%	0.56%	0.00%
2012	0.02%	0.41%	0.24%	13.73%	7.23%	0.48%	0.00%

2013	0.02%	0.46%	0.23%	15.38%	7.07%	0.51%	8.96%
2014	0.02%	0.42%	0.21%	15.77%	9.46%	0.46%	2.87%
2015	1.27%	0.41%	0.22%	16.75%	10.02%	1.83%	6.52%
2016	0.42%	0.38%	0.26%	16.86%	10.65%	1.69%	6.35%
2017	1.85%	0.39%	0.28%	16.80%	11.83%	1.70%	5.39%

Table 7: R&D Education (Sub-classification code 7097)

Year	UK	Netherland	Germany	Czech Republic	Lithuania	Poland	Georgia
2007	7.36%	0.27%	1.33%	0.91%	8.80%	1.20%	3.74%
2008	7.98%	0.38%	1.33%	1.20%	7.93%	1.31%	4.83%
2009	7.08%	0.62%	1.27%	1.37%	4.50%	1.41%	12.88%
2010	6.90%	0.58%	1.22%	1.37%	6.42%	1.37%	13.96%
2011	6.90%	0.54%	1.13%	1.33%	11.61%	1.36%	12.85%
2012	5.84%	0.33%	1.16%	1.54%	8.83%	1.49%	14.71%
2013	5.78%	0.23%	1.08%	1.53%	11.85%	1.60%	9.75%
2014	5.78%	0.23%	1.05%	1.80%	7.93%	1.52%	12.75%
2015	6.34%	0.22%	1.02%	1.71%	6.12%	1.34%	20.16%
2016	5.94%	0.08%	1.09%	1.38%	6.21%	1.27%	18.82%
2017	6.23%	0.08%	1.09%	1.60%	6.13%	1.58%	24.79%

Table 8: Education not elsewhere classified (Sub-classification code 7098)
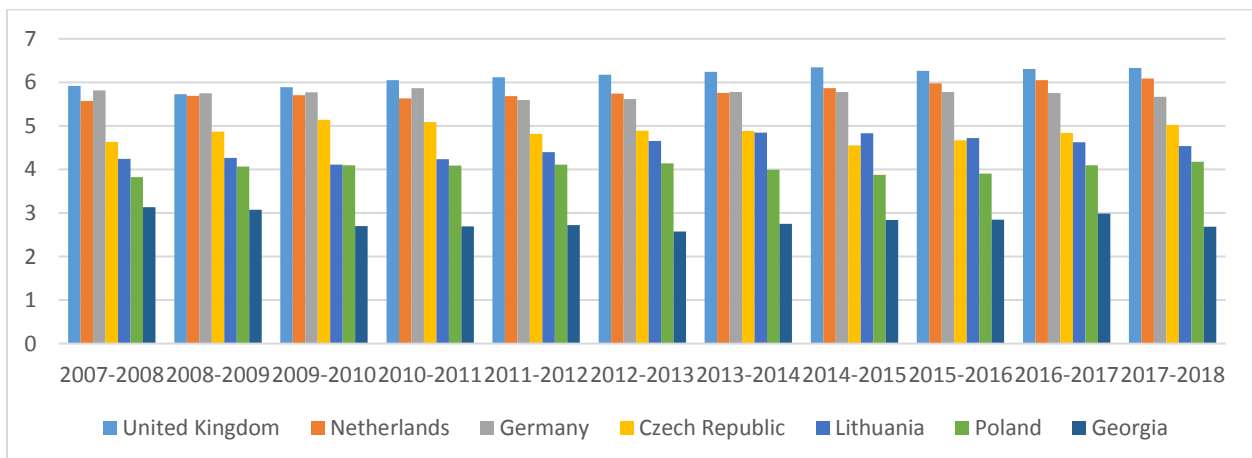
Appendix B (Factors of Global Competitiveness Index)
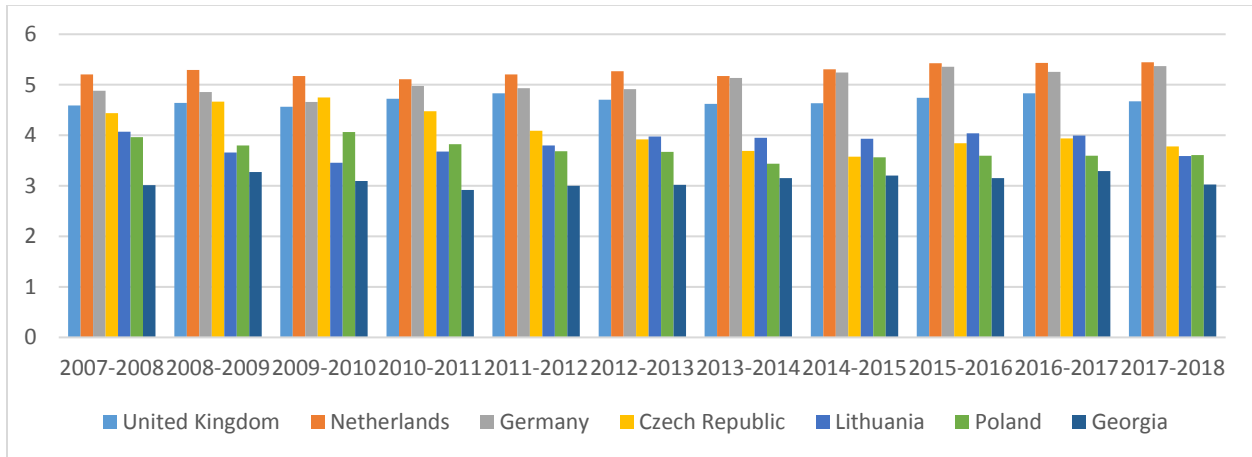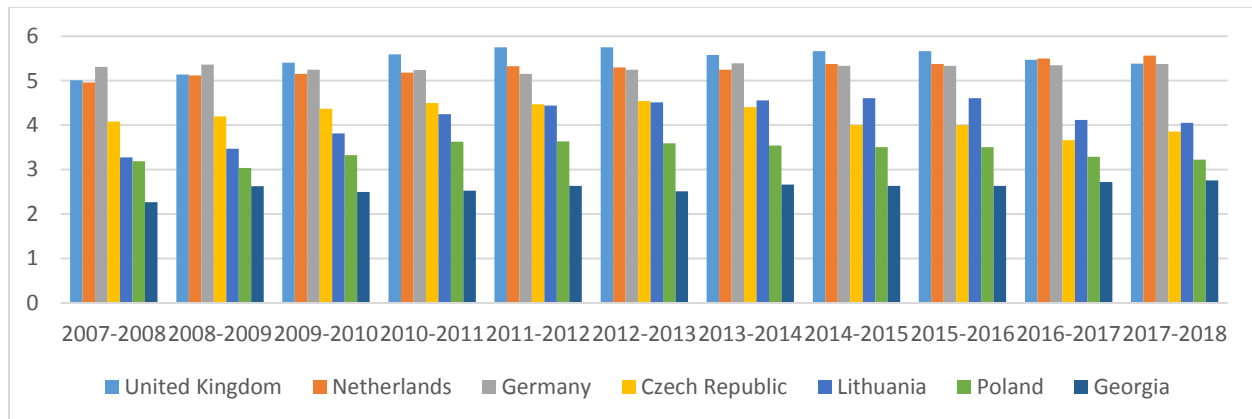

Graph 8: Quality of the Education system, 1-7 (best)
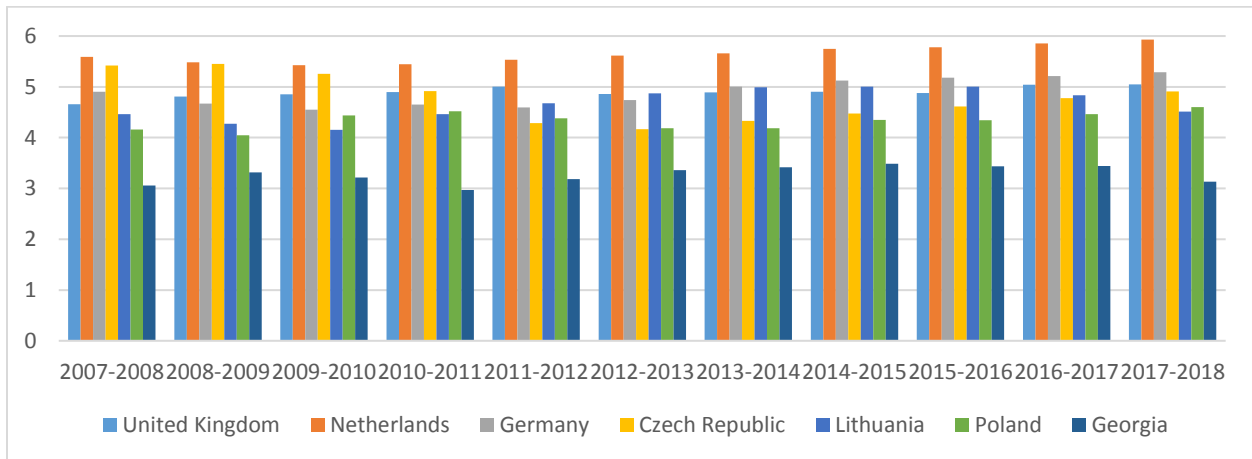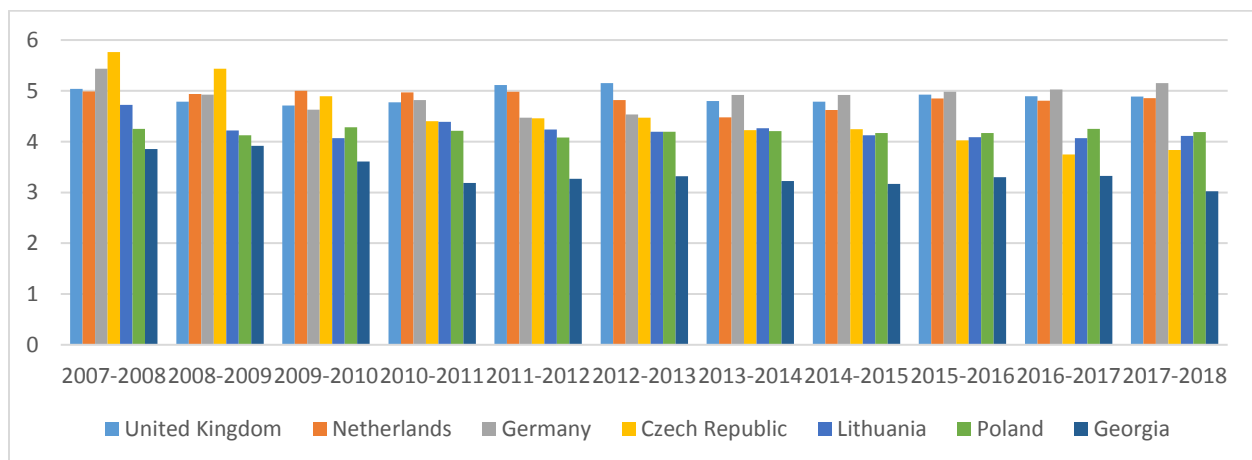

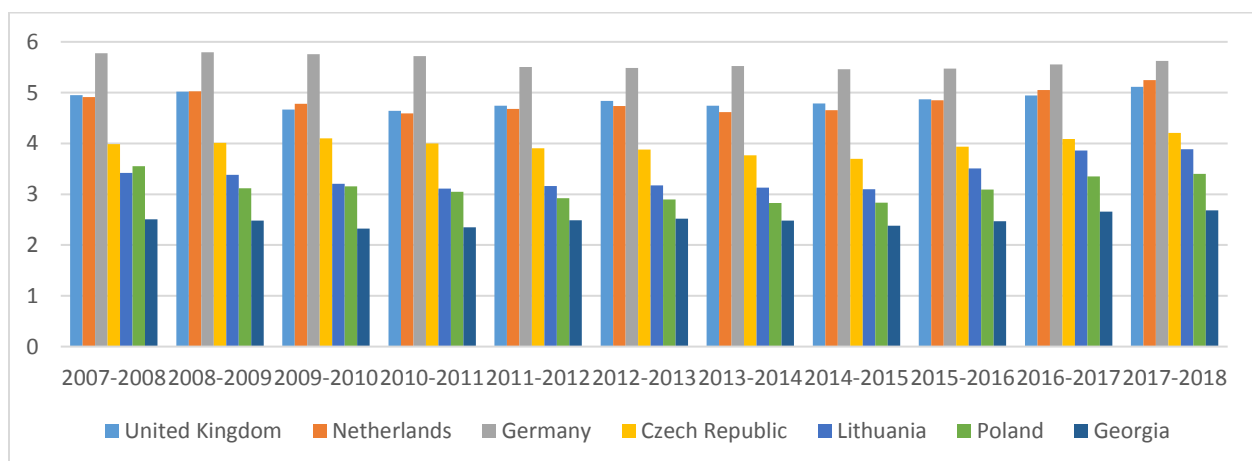**Graph 9: Quality of primary education, 1-7 (best)**

Graph 10: Quality of scientific research institutions, 1-7 (best)

Graph 11: University-industry collaboration in Research & Development, 1-7 (best)

Graph 12: Availability of scientists and engineers, 1-7 (best)

Graph 13: Company spending on Research & Development, 1-7 (best)