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THE ROLE OF HUMAN CAPITAL AND INNOVATION IN ECONOMIC GROWTH: EVIDENCE FROM KAZAKHSTAN

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Abstract. *This article investigates the role of human capital and innovation in economic development of the country. Aim of the research is to investigate theoretical and methodological basis of the role of human capital and innovation in economic growth, evaluate current state of human capital and innovation activities, and develop scientific and applied recommendations to strengthen capacity and improve competitiveness of human capital in the developing countries.*

This paper contributes to the literature by fulfilling a theory of human capital development in the knowledge economy, revealing the relational mechanism between human capital development, innovation, and economic boundary of these relationship. It also contributes to the further understanding of the role of human development and innovation in economic development. This study result implies to strengthen capacity and improve the competitiveness of human capital, draft human capital development policy.

We used statistical data analysis, index calculation method, method of UNDP, and method of correlation and regression analysis. The sample mean method is used in the calculation of average national test results.

The analysis of the existing researches and debates is made. We defined the current state of human capital and innovations in Kazakhstan. According to analysis of the coverage of pre-school education half of children don't have access to education. Moreover, Preschool enrollment in Almaty, Zhambyl, Mangystau, Atyrau regions, and Almaty, Nur-Sultan, Shymkent cities are below the republic average line. In the most of regions the rate has increase for about 0,1 indicator, while in Aktobe, Atyrau, Kostanay regions, and Nur-Sultan city the difference of base period and 2019 is negative. The quality of secondary education became worse year by year. Youth from the regions are migrating within the country to get higher education especially in the nearby regions as Almaty, Akmola, Zhambyl, Turkistan regions.

Analysis of current state of innovative activity showed that Kazakhstan had the low productivity in patents, creations, and publicity activity.

Keywords*: economic growth, human capital, innovation, human development, new technologies, education coverage, education quality*

Introduction

Oil industry is aiming to its end, while the economy of Kazakhstan directly depends on this resource. The attempts to diversify economy has started in the middle 2000's, however, still in the progress. Innovational development strategy is becoming the only way to achieve economic safety of the country.

Output of human capital is new technologies and patents, while they are driving force of economy. Humans are not only an aim but a resource in social and economical development. Human factor is becoming more important as an object of investment than fixed assets and technologies (K. Sagadiev, 2012). Therefore, countries are interested in developing human resources to get a labour force to implement low skilled and high skilled jobs.

On the other hand, in the process of developing technologies low skill job offers are decreasing. According to the forecast of World economic forum 85 million people lose their jobs in 2025 because of division work between humans and machines and developing

technologies, while demand for new professions will be 97 millions. In other words, employment market is changing and requiring the new quality of human capital.

According to the index of human development, Kazakhstan took 50 place, with rating 0,817 out of 10 among 189 countries, and counted as a country with a very high level of human development. However, in the knowledge economy sector worked only 11% of the population according to state statistics. Meanwhile, the global innovation rating with ranking 77 is quite low (28,56 score out of 100), which is twice lower than in the developed countries as Switzerland (66,08), Sweden (62,47), the USA (60,56). Moreover, the innovation output Kazakhstan (14,34 score) is behind the following post-Soviet countries as Armenia (27,15), Russian Federation (24,62), Belarus (21,23), Georgia (19,66), Azerbaijan (15,29). Lack of qualification and low qualification of human capital could be a challenge for the economic growth of the country.

Developing technologies are driven force of economic growth. Historically, developed countries reached their peak with introducing new technologies that increase the productivity. New ideas and technologies are developed and applied, generating greater output with the same input.

Researches are shown scientific interest in human capital development and quality issues. However, there are not all conclusions and results are suitable for the reality of Kazakhstan. This issue is not investigated enough in Kazakhstan and required to analyze it. This research will reveal theoretical and methodological basis of human capital development, economical analysis of current state of human capital, and mechanism of developing human capital. This work is significant to evaluate impact of human capital and innovation on economic growth.

Aim of the research is to investigate theoretical and methodological basis of the role of human capital and innovation in economic growth, evaluate current state of human capital and innovation activities, and develop scientific and applied recommendations to strengthen capacity and improve competitiveness of human capital.

This paper uses estimates of innovation and human capital stocks to examine evidence on the determinants of economic growth. Indication and regression methods are used.

This paper contributes to the literature by fulfilling a theory of human capital development in the knowledge economy, revealing the relational mechanism between human capital development and innovation, and economic boundary of these relationship. It also contributes to the further understanding of the role of human development and innovation in economic development. The outcomes may be the basis for the following research of human capital trends development and quality issues in Kazakhstan.

First, we review the literature in order to gain an understanding of the existing researches and debates.

Second, we define the current state of human capital and innovations in Kazakhstan. It helps to understand and evaluate the current situation of human capital and new technologies issues. In the results of this research, we could develop the ways to increase accumulation of human capital to achieve sustainable growth.

Third, we defined the interrelationship of innovation, human capital and GDP in multiple regression analysis.

This study result imply to strengthen capacity and improve the competitiveness of human capital, draft human capital development policy.

Literature review

One of the first researches of impact of innovation on economic growth was Joseph Schumpeter (2003) where he described the process of development innovations and their driving force in the enterprises, that effects on economy of the whole country consequently. Also, he mentioned the role of human in the implementation and introduction of new technologies in productive process. Based on the research it could be concluded that the innovations lead to the qualitative changes in economy and transferring to the next level of development.

In the paper 'A Contribution to the Theory of Economic Growth' R. Solow (1956) investigated neoclassical model of growth and indicated that new technologies are the key factor of economic growth, also pointed on human capital factor. Denison (1967) in his classification of economic growth made attempts to quantify the contribution of human capital to a country's rate of economic growth.

However, evolution of endogenous growth theory in 80's is broaden the knowledge of the role of innovation and human capital in the economic growth. Romer (1986, 1990), Lucas (1988), and Mankiw et al. (1992) focused on the role of human capital as a factor of production and fulfilled and extended neoclassical growth model. Lucas (1988) also pointed out a second role of human capital, i.e., the level of human capital as a source of positive externality to have an impact on growth.

On the other hand, Nelson and Phelps (1966) specified that human capital is not only a factor input in the production function. They stressed on the role of human capital as a tool of local innovation and technology. According to Nelson and Phelps, people with education are the bearers of human capital, which helps in local innovation, technology development and also helps to adapt the foreign technology. Moreover, it is defined that technology adoption for advanced economies demands the educated and digital skilled workforce. Sustainable and innovative economy cannot be achieved without the adoption of technology (Salam et al.,2019).

The increasing the productivity effects of human capital on economy. As a result, the economic growth of countries depends on the level of human capital (Aghion& Howitt, 1992). The quality of human capital is important in order to adopt technologies (Vandenbussche et al., 2006) that enhance the economic growth of the country (Teixeira et al, 2016). Lahiri and Ratnasiri (2012) pointed out that human capital, R&D, and economy of country is important in adoption technology that emerge economic development.

P. Agion and P. Howitt (1992) and Charles Jones (1995) pointed out that human capital is the main factor of production of new knowledge and innovation.

Based on the research of the model of technology dissemination of R.Barro and H.Sala-i-Martin (1992), proved the possibility of faster economic growth with new technologies.

It is concluded the assumption that impact of technical and technological changes on marcoeconomic dynamics depends on level of human capital development (Benhabib, 1994). The emerging innovative activity in the economy which lead to the increasing the pace of growth directly depends on financing education system (Ivasenco et al., 2009).

Papageorgiou (2003) defined that difference in relative contributions of human capital to technology adoption and final-goods production seem to vary by country wealth. Human capital in the high-income countries are facilitators of innovation and imitation of technology. While, low-income countries the role of human capital is as an input of final output production and as a facilitator of imitation. That means that the country should reach some level of development before the returns of R&D activities become significant. Coe et al (1997) and Engelbrecht

(2002) revealed that developing countries could get economic output through diffusion of developed countries technologies.

Hongxing Peng et al. (2020) discovered that human capital mitigates the negative effect of financial constraints on innovation investment persistence. They have found the mechanism through which human capital at the management and employee levels affects innovation investment persistence. They indicated that management human capital affects innovation investment persistence through the expectation of authorised patents, while employee human capital affects the persistence through salary stickiness. Furthermore, management human capital contributes to an increase in future granted patents through persistent innovation investment.

'Absorptive capability' plays an important role in accelerating the technological catch-up (increase in the efficiency) but not on the technological changes (Mastromarco, C.& Simar, L., 2021). This result seems to confirm the theoretical hypothesis that countries benefit from new technology (technological catch-up) only when they have the ability to exploit it, hence only when they have high level of absorptive capability.

According to Rahman (2016) the developing countries should diversify economic relations with many developed countries because they can serve as a technological leader in the catch-up process. The role of human capital in technological catch-up is significant and developing countries should take pro-education policies to speed technological catch-up.

Zhou, H., Qu, S., Yang, X., & Yuan, Q. (2020) showed that regional credit and technological innovation are important impacts to economic growth, whereas the interaction of regional credit and technological innovation has a negative effect on provincial economic growth. That proves the importance of rationally allocation of regional credit resources, strengthen technological innovation capabilities, and boost the integrated development of regional credit and technological innovation.

Human capital speeds up the creation of new technologies (Ehrlich, 2007) and economic growth is possible with uninterruptedly technological progress. Investment in human capital defines the ability of national economy to generation of new knowledge, and effective transfer foreign technologies, that increase growth pace of national economy. However, it is complicated to measure the impact of innovation on the economic growth. At the period of 4th technological revolution the key factor for sustainable growth is human capital.

Methods

Index method is used to analyze the current state of human capital in Kazakhstan. As indicators of human capital, we have considered education, health, and living standards.

Index of education consist of 2 part: 1) education coverage. 2) quality of education. We have calculated education coverage including the pre-school, primary school, secondary school, and higher education from 2015 to 2019 with methodology of OECD dimension index formula (1)

$$Dimension\ index = \frac{actual\ means - minimum}{maximum - minimum} \quad (1),$$

where minimum is 0, while maximum is 100.

Quality of education is more complicated, because of lack of statistical data. We have considered the regional average National test points with the same OECD formula (1), where considered minimum as 0, however maximum as 125 points for the year 2015,2016, while 140 for the following years, because of change of the format of testing.

Indicator of health index is expectancy of life. We used dimension index (1) to compute health index, where minimum is 20 and maximum is 85 (OECD)

In the index of living standards, in this calculation, we will replace GNI per capita with GDP, due to the lack of statistical data in Kazakhstan.

$$\text{Index of living standards} = \frac{\ln(\text{actual value}) - \ln(\text{minimum})}{\ln(maximum) - \ln(minimum)} \quad (2),$$

where minimum value is 100, and maximum is 75000.

$$HDI = \frac{\text{education index} + \text{health index} + \text{index of living standards}}{3} \quad (3)$$

Quantitative method used in order to evaluate the dependence of the human capital and innovations. Governmental statistical data from the period 1991 to 2019 is observed in the research. Human developmentl index, volume of innovative products, and GDP are included into calculations. At the specification stage, multiple linear regression were selected. Its parameters are estimated using the enter method.

The current state of human capital and innovation

Kazakhstan oriented to the high goals to sustainable economy according to Strategy 2025. First of all, they are new quality of human capital and technological renewal and digitalization.

World is in the struggle because it should prepare human to specialties that don't exist. Technologies are developing rapidly, and most of the workplaces will disappear in the close future. Therefore, educational institutions have to teach students to the universal skills as critical thinking, work with big data, teamwork, and ability to work in the changing world.

The pandemic COVID-19 showed that Kazakhstan wasn't ready to change education model. Governments had to close schools, as a result it has been one year that pupils don't receive full range of education. Increasing level of inequality in access to the quality education has risen that increase the gap among students. Probably distant learning would be less effective to all students, although students from vulnerable population would be even less effective. Only students who have a good connection and the required number of computers and other devices could use the opportunities of online learning.

Moreover, distance learning makes a challenge for teachers and lecturers, who don't have the required qualification in online teaching, and for students, who don't have access to the internet and computers. For instance, students and teaching staff faced cyberattacks, low speed of internet, and freezing of study platforms. In addition, distance learning effects on quality of education, because of an insufficient level of education, which lead to the economic losses in the future (World Bank, 2020). As a result of the pandemic, the negative effect of education might lead to the growing quantity of functionally illiterate students. Skills of graduates will be lower, that might effect on their future employment. Negative impact on education and reducing years of learning, lead to diminish expected income on 2.9%. Economic loses would be up to $1.9 bln. (World bank, 2020).

Innovations and new technologies are changing labour market. Gap in skills is increasing. Companies and corporations require high-skilled employees, while the education system is not ready to supply human capital with desirable skills. As a result of developing machine learning and artificial intelligence, some professions niche is reducing (administrative

and supporting personnel, typist, etc.).

Government gave academic freedom to universities. Universities offer new education courses to perspective students as Cyberphysical system, Biocomputing, Business Journalism, SMM and PR, and etc. However, the content of study didn't change.

The results the index of human development in 2019 in Kazakhstan is 0,7(Figure1), which is considered as high. However, in the last 5 years there is not significant change in the dynamic. It has risen 0,02 points for the whole period, but it decreased in 2019 in comparison with 2018 because of index of education (Figure2). The coverage of pre-school education (Figure4) and higher education are quite low (Figure7), while primary (Figure5) and secondary education (Figure6) is 1 or almost 1.

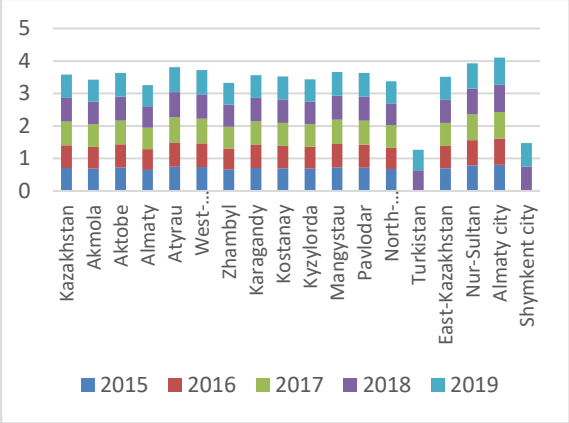

Figure 1. Index of human development.
Source: Compiled by author

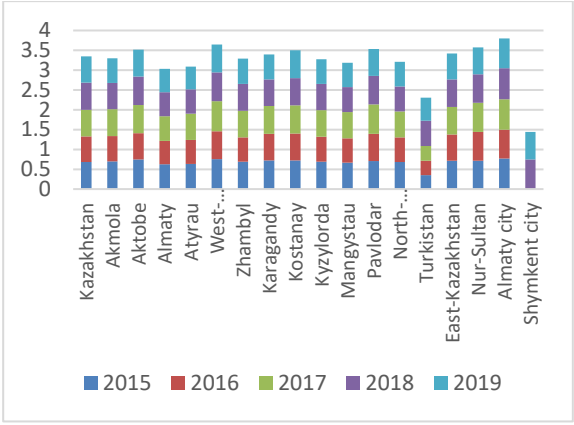

Figure 2. Index of education.
Source: Compiled by author

Firstly, level of education differ region to region, however average Kazakhstan's education index is 0,66 in 2019. At the beginning of the period the index was. 0,68 In the period of 2015 -2019 there is downward trend in this index with a fluctuation in 2016 (0,64) (Figure 2).

The coverage of pre-school education in Kazakhstan is rising from 0,46 to 0,53 in the given period. Preschool enrollment in Almaty, Zhambyl, Mangystau, Atyrau regions, and Almaty, Nur-Sultan, Shymkent cities are below the republic average line, that means that almost half of children are not able to get preschool education. In the most of regions the rate has increase for about 0,1 indicator, while in Aktobe, Atyrau, Kostanay regions, and Nur-Sultan city the difference of base period and 2019 is negative. Government should pay more attention to the preschool enrollment, because it affects to the future study outcomes at school (Figure 3).

Primary education covered 98, 1% in the base period and reached 99,64% in 2019, and 1 for secondary education which is considerably high indicator. That means that almost 100% of children and able to write and read (Figure 4, 5).

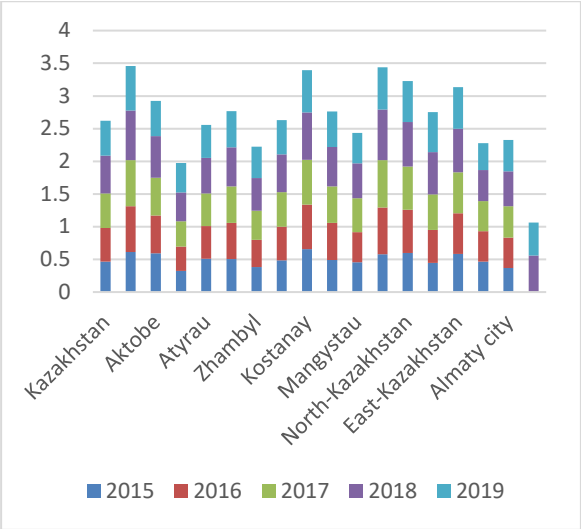

Figure 3. Index of pre-school coverage
Source: Compiled by author

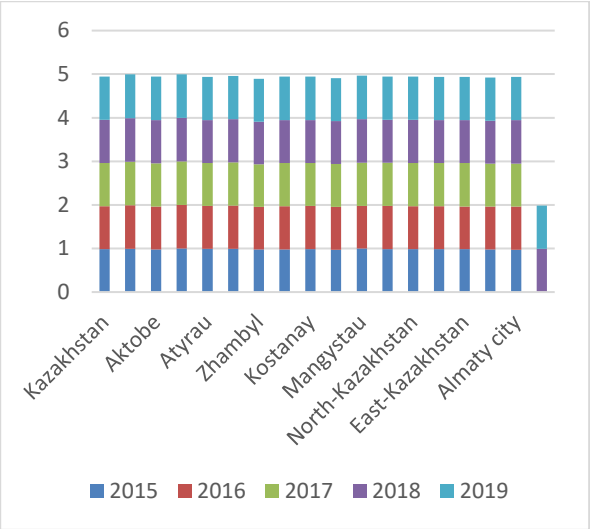

Figure 4. Index of primary education coverage
Source: Compiled by author

Higher education coverage is rising from 0,48 to 0,67 in the period of 5 years. However, the youth education in the regions is low, it may because of the lack of universities. Also, it is seen that in Almaty, Nursultan, and Shymkent cities this indicator covers 100%. Youth from the regions are migrating within the country to get higher education especially in the nearby regions as Almaty, Akmola, Zhambyl, Turkistan (Figure 6).

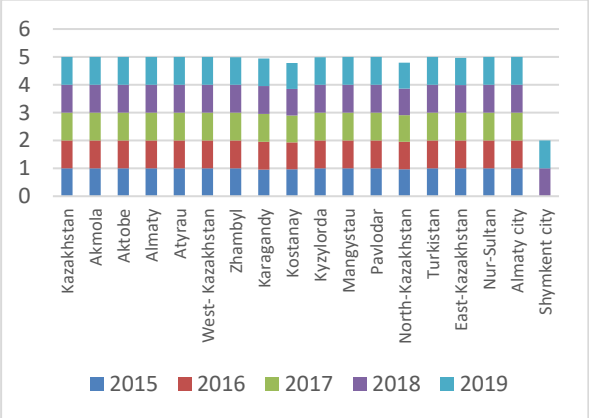

Figure 5. Index of coverage of secondary education.
Source: Compiled by author

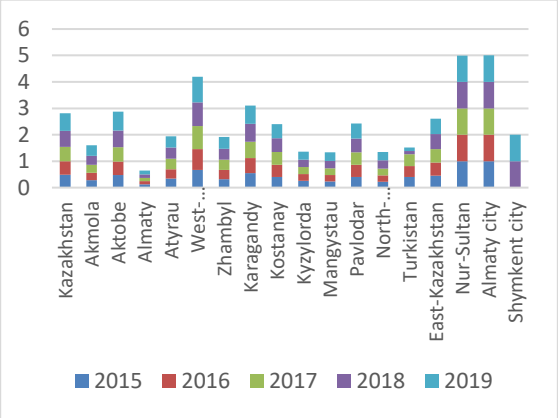

Figure 6. Index of coverage of higher education.
Source: Compiled by author

Figure 7 indicated the quality of education where we have considered average points in the National test among school graduates. The educational outcome of students is showing downward trend with fluctuation. At initial period national results index was 0,63, and fell up to 0,52 in 2016. The years 2017-2018 it rose to 0,59, however dropped in 2019 again to 0,52. The decreasing of average point may be as a result of modifying the format of test that occurs in the period. The most noticeable change had happened in Karaganda region with falling off 0,23 in comparison with base period, while in Kostanay region, Almaty, Nur-Sultan cities the least significant change with lowering 0,07.

PISA test results were not included into index calculation because of lack of regional data. However, there the decreasing level of performance is seen. Moreover, average results is lower than OECD countries with up to 100 point difference.

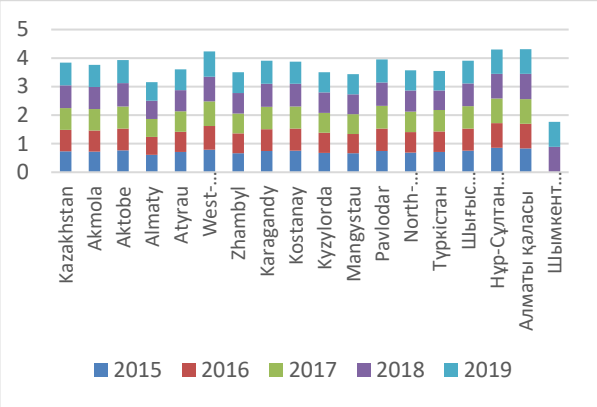

Figure 7. Index of coverage of education quality.
Source: Compiled by author

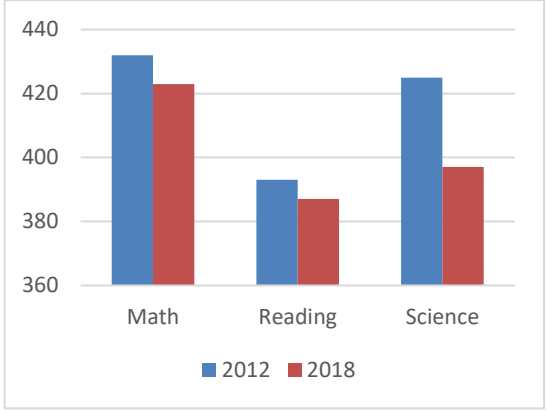

Figure 8. PISA results (2012,2018)
Source: Compiled by author based on OECD data

Gross regional product (GRP - hereafter) per capita has risen from 0,638 to 0,653 in the period between 2015 -2019. Standards of life differ from region to region. The lowest index in Almaty and Zhambyl regions, while the highest in Atyrau region, Almaty and Nur-Sultan cities (Figure 9). However, Almaty and Nur-Sultan cities have better standards of life in comparison with other regions, the indicator of GRP per capita remains at the level of 2015 with insignificant growth. GRP of Atyrau region (0,89) is twice higher than the same indicator of Turkistan region (0,49). The low level of life in Turkistan region also may be one of the reasons of low education index in the region.

The state of health of the population is becoming better, and the index has risen to 0,02 points from 0,80 to 0,82 in Kazakhstan. According to Figure 10, health index in the regions is high (0,78 - 0,85). Considerably lower than average in the country is in Akmola (0,79) and North-Kazakhstan (0,78) regions. The highest index is in Nur-Sultan and Almaty cities, which is 0,87 and 0,85 respectively. North Kazakhstan region and Almaty city's indicator didn't change in the past 5 years.

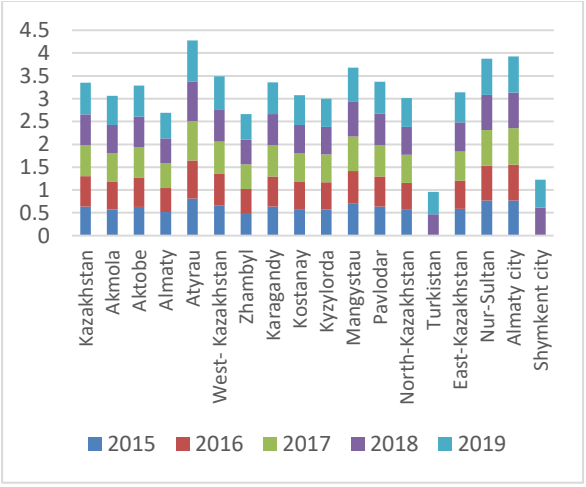

Figure 9. Index of life standard.
Source: Compiled by author

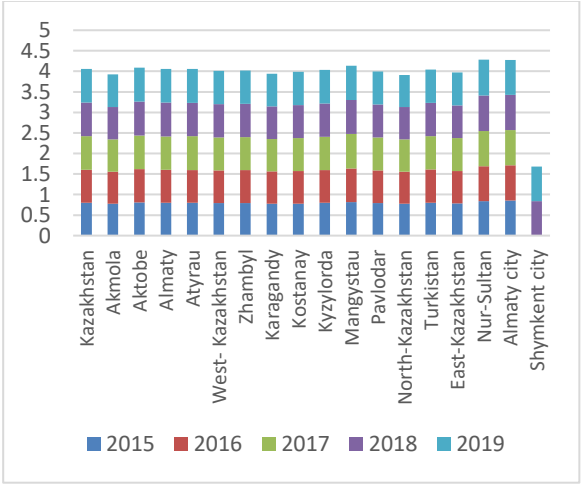

Figure 10. Index of health.
Source: Compiled by author

The aim of country is achieving sustainable development with innovational activity. Therefore, Tech Garden or Park of innovative technologies and Astana Hub projects appear in 2016 to develop innovational clusters. They are state projects of acceleration that help to develop innovational ideas, supply infrastructure, financial support, mentoring, access to investors and opportunities to experience exchange with foreign innovators. Cluster Park of innovative technologies include 23 Higher education institutions, 25 Research institutions, 2 technoparks and 1 institute of development. 175 enterprises are supported by Tech Garden at the moment. Astana Hub is international technopark of IT startups.

Other indicators of innovation activity are patenting (Figure 11) and scientific publications (Figure 12). The ratio of productivity is 0.08 patents and protective documents and 0.28 publication in Scopus base for each scientist in Kazakhstan. Granted protective papers on innovation is reduced twice in comparison from 1504 to 730 with initial period.

Low productivity may be as a result of underfunding of R&D. R&D expenditure for 2019 is 82333.1 mln KZT, which is 0.11% of GDP. In comparison with developed high income countries where R&D expenditure is more than 2% of GDP (Israel 4.95%; South Korea 4.81%; the USA 2.83). Average salary per month is 146599,216 KZT, which is about US $350, that is comparatively low.

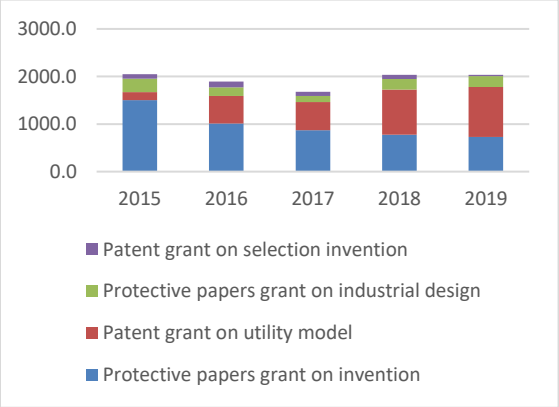

Figure 11. Output of innovative activities
Source: Compiled by author

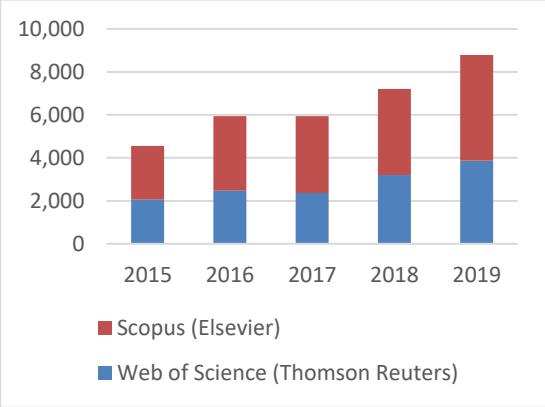

Figure 12. Output of innovative activities
Source: Compiled by author

Table 1. Indicators of innovative activities of R&D

	Number of R&D employees	Web of Science (Thomson Reuters)	Scopus (Elsevier)	Labour costs, mln KZT	Share of innovative production (comodities, services) to GDP , %	Key figures of innovative enterprise activities, all types of innovations
2015	24735,0	2 048	2 502	35730,0	0,9	2585,0
2016	22985,0	2 473	3 470	31889,9	1,0	2879,0
2017	22081,0	2 362	3 583	31564,1	1,6	2974,0
2018	22378,0	3 200	4 005	34823,2	1,7	3230,0

2019	21843,0	3 872	4 909	38426,0	1,6	3206,0

The number of innovative active enterprises are increasing rapidly. The number of innovative companies and the volume of innovation commodities correlated very weakly (0,19). The most significant growth is in Karaganda, East Kazakhstan regions, and Almaty, Nur-Sultan cities. The highest innovative activities are in Pavlodar, East- Kazakhstan, and Kostanay regions.

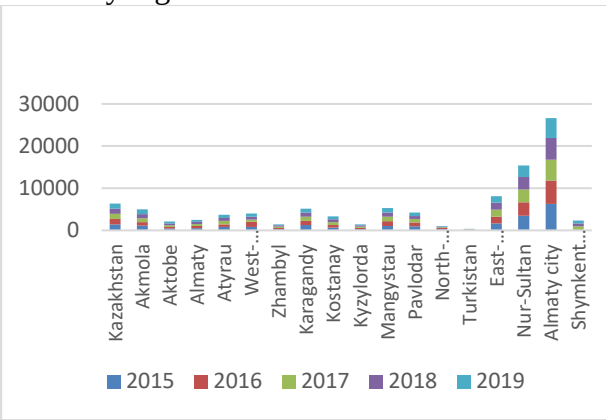

Figure 13. Research and development personnel per million population

Source: Compiled by author

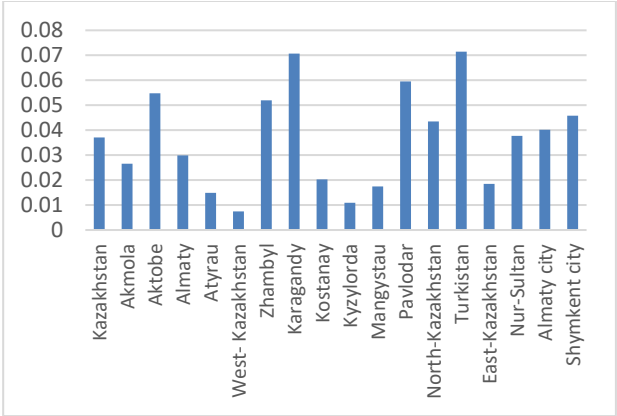

Figure 14. Productivity of research and development, patent applications, 2019

Source: Compiled by author

R&D personnel is decreasing for 9% in the last 5 years from 726,3 to 667,62 per million overall in Kazakhstan (in average calculation we have exclude Almaty and Nur-Sultan cities). Almaty city has the highest number of R&D staff per million population (4687,89 in 2019), which is equal to developed countries level as France – 4715,31, UK- 4603,31, Portugal – 4537,53. Nur-Sultan city also has high density of researchers (2733, 75 in 2019). East Kazakhstan region has twice more researchers than average in the country, while Turkistan has only 90,99 scientists per million.

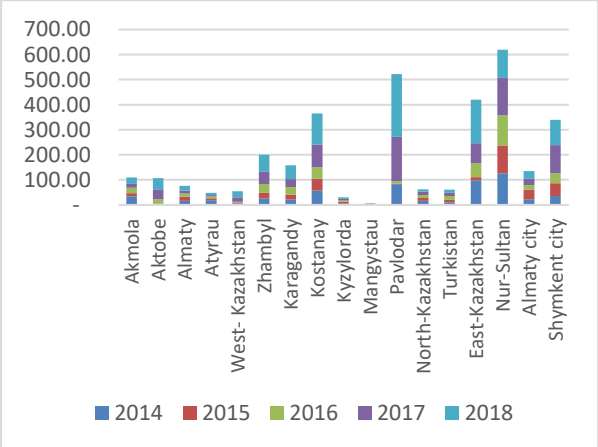

Figure 15. Volume of innovative production, bln KZT

Source: Compiled by author

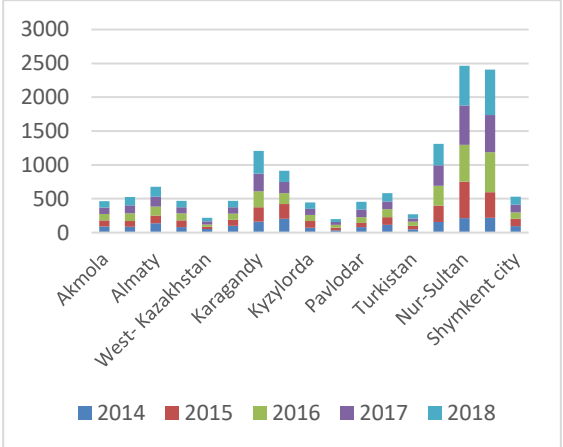

Figure 16. Innovative active enterprises

Source: Compiled by author

The number of innovative enterprises is increasing in the country. However, Kostanay region reduced the number of innovative enterprises from 204 to 163, which is almost 20%.

The rapid growth of innovational companies is in Almaty (+451), Nur-Sultan(+369) cities, Karaganda (+177), and East Kazakhstan (160) regions. More than half of innovative companies are located in Almaty, Nur-Sultan cities, Karaganda, and East Kazakhstan regions. However, the largest amount of innovative production was produced by Nur-Sultan, Pavlodar region. Almaty city's production is lower than expected. Therefore, the volume of innovative activity contradicts the number of active enterprises, researchers, and patent productivity and it didn't correlate.

In the aspect of productivity of R&D Turkistan and Karaganda regions have the highest ratio, that is equal to 0,07, while the lowest activity is in West Kazakhstan, Kyzylorda, and Atyrau regions.

Regression analysis

Quantitative method used in order to evaluate the dependence of the human capital and innovations. Governmental statistical data from the period 2003 to 2019 is observed in the research. Human development index, volume of innovative products, and GDP are included into calculations.

Table 2. Variables Entered/Removeda
Source: Compiled by author on SPSS

Model	Variables Entered	Variables Removed	Method
1	volume of innovative products, human development index[b]		Enter

a. Dependent Variable: GDP
b. All requested variables entered.

Table 3. Model Summary
Source: Compiled by author on SPSS

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			
					R Square Change	F Change	df1	df2
1	.986[a]	.972	.968	3531807.83260	.972	229.414	2	13

Table 3 shows the coefficient of determination (R^2), as a whole, the regression does an extreme high modeling of GDP. The coefficient of determination (R^2) indicates that 97,2% of the variance in GDP can be predicted from the variables Human development index and volume of innovative products.

Table 4. Model Summary
Source: Compiled by author on SPSS

Model	Change Statistics	Durbin-Watson
	Sig. F Change	
1	.000	1.020

a. Predictors: (Constant), volume of innovative products, human development index
b. Dependent Variable: GDP

The Durbin Watson test reports that there is a positive autocorrelation in data.

Table 5. ANOVA[a]
Source: Compiled by author on SPSS

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5723260537965907.000	2	2861630268982953.500	229.414	.000[b]
	Residual	162157665363493.720	13	12473666566422.594		
	Total	5885418203329401.000	15			

a. Dependent Variable: GDP
b. Predictors: (Constant), volume of innovative products, human development index

The ANOVA table reports p-value is .000, that's less than .05 or 5% therefore the overall model is a statistically significant.

Table 6. Coefficientsa
Source: Compiled by author on SPSS

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound
1	(Constant)	-316222578.359	53046567.955		-5.961	.000	-430822721.102
	Human development index	432988861.439	70508970.829	.605	6.141	.000	280663490.860
	Volume of innovative products	23.448	5.639	.410	4.158	.001	11.267

The coefficients in table 5 shows that model fit looks positive. The regression intercept takes value 53046567.955 while the regression slope for human development index takes value 70508970.829 and the slope for WEALTH takes value 5.639. Volume of innovative products has a small coefficient compared to human development index that contributes more to the model because it has a larger absolute standardized coefficient, where volume of innovative products is highly important than human development index.

There are two standardised slopes with the slope for human development index taking value .605 and the slope for Volume of innovative products taking value .410.

For human development index the slope has t statistic 6,141 and the p value (quoted under Sig.) is .000 (reported as $p < .001$) which is less than 0.05. We therefore have significant evidence to reject the null hypothesis that the slope on human development index is zero. For volume of innovative products the slope has t statistic 4.158 and the p value (quoted under Sig.) is .000 (reported as $p < .001$) which is less than 0.05. We therefore have significant evidence to reject the null hypothesis that the slope on volume of innovative products is zero. For the intercept the t statistic is -5.961 and the p value (quoted under Sig.) is .000 (reported as $p < .001$) which is less than 0.05. We therefore have significant evidence to reject the null hypothesis that the intercept is zero.

Table 7. Coefficientsa
Source: Compiled by author on SPSS

Model		95.0% Confidence Interval for B Upper Bound
1	(Constant)	-201622435.617
	Human development index	585314232.017
	Volume of innovative products	35.630

a. Dependent Variable: volume of innovative products

The confidence intervals for the coefficients and so a 95 percent confidence interval for the intercept takes values between -430822721.102 and -201622435.617.

Similarly a 95 percent confidence interval for the slope for human development index takes values between 280663490.8 and 585314232.017. Here we see the confidence interval does not contain 0 which corresponds to the fact we could reject the null hypothesis that the slope was 0.

Table 8. Residuals Statisticsa
Source: Compiledby author on SPSS

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	5941194.0000	64939424.0000	31244983.6137	19533322.87480	16
Residual	-4101688.00000	5633004.50000	.00000	3287934.15753	16
Std. Predicted Value	-1.295	1.725	.000	1.000	16
Std. Residual	-1.161	1.595	.000	.931	16

a. Dependent Variable: GDP

Conclusions

Using data of 14 regions and 3 cities in Kazakhstan from 2015 to 2019, this paper establishes that human capital is considerably high, however there is no significant improvement in the last 5 years. Education, health, and well-being components were considered in order to get more details. According to Gemmell (1995) the school enrolment rates captured the level, rather than the growth, of human capital. Education policy of country should be reconsidered to increase the coverage of pre-school education, because according to results about half of children don't have access to it while it is considering as important period of human capital development (Frumin, 2018, Dürdane Şirin Saraçoğlu &Deniz Karaoğlan, 2018). Other words, early development assists to increase the education outcomes and it the basis of perspective human capital. Preschool enrollment in Almaty, Zhambyl, Mangystau, Atyrau regions, and Almaty, Nur-Sultan, Shymkent cities are below the republic average line, that means that almost half of children are not able to get preschool education. In the most of regions the rate has increase for about 0,1 indicator, while in Aktobe, Atyrau, Kostanay regions, and Nur-Sultan city the difference of base period and 2019 is negative.

Other issue is the quality of secondary education, that is decreasing year by year despite the fact of content and structure changes in assessing the knowledge of students. Increasing students' knowledge should be one of the priorities of development. Special measures should be accepted for regions with lower indices than republic average.

Considering the fact of higher education enrollment is increasing, they should supply necessary labour force in the future. The youth tertiary education in the regions is low, it may because of the lack of universities. Also, it is seen that in Almaty, Nursultan, and Shymkent cities this indicator covers 100%. Youth from the regions are migrating within the country to get higher education especially in the nearby regions as Almaty, Akmola, Zhambyl, Turkistan regions.

Analysis of current state of innovative activity showed that Kazakhstan had the low productivity in patents, creations, and publicity activity. Low productivity may be as a result of underfunding of R&D.

Human development index and innovative activity is highly correlated with GDP, in other words these indicators are significant for economic growth. The coefficient of determination (R^2) indicates that 97,2% of the variance in GDP can be predicted from the variables human development index and volume of innovative products.

To conclude the above-mentioned factors the following recommendations should be considered:

1) Supply children with pre-school education by building the kindergartens and supplementary education centers;
2) Increase the quality of secondary education and teach students how to apply their knowledge;
3) Involve more students in the regional universities and provide high-quality education;
4) Increase R&D expenditure to stimulate innovative activities
5) Stimulate researchers and scientists to inventions and publications by increasing the salary and status.
6) Reconsider the list of innovative enterprises

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