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Human Capital in the Innovative Economy: Manufacturing Industry

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Abstract

Human capital is a crucial determinant of economic development because of the rapid pace of scientific and technological progress. The objective of the research is to define the state of human capital in manufacturing and to find the link between human capital and innovation. The correlation and regression analysis of the Human Capital Index designed and calculated by World Bank and Global Innovation Index was designed and calculated by WIPO of 127 countries in the year 2020. The second part of the analysis was the human capital in the manufacturing sector. The secondary data from the Bureau of National statistics were taken from the year 1991 to the year 2020. We analyzed the composition of workers by gender composition, gender pay gap, the number of bachelors graduated of technical major, aging, and education. HCI of Kazakhstan in 2020 is dropped; a possible reason for this is the COVID-19 pandemic's side effect on the health and education of the population. The correlation between Global Innovation Index and Human Capital Index is 0,86. The 50% gender gap is revealed in the manufacturing sector employees, which shows an upward trend. Most workers in the manufacturing industry do not have a bachelor's degree, which means that they perform hand labor rather than mental. Probably increasing the innovation used in the country may decrease the number of employees without proper education, while the productivity of the manufacturing sector will increase. However, we should consider that unemployment will increase either.

Keywords: Economy, Human Capital Accumulation, Human Capital, Intellectual Capital, Knowledge-Based Economy, Manufacturing Sector, Strategy, Innovation

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Инновациялық экономикадағы адами капитал: өндіріс секторы

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Түйін

Ғылыми-техникалық прогрестің жылдам қарқынына байланысты адам капиталы экономикалық дамудың шешуші факторы болып табылады. Зерттеудің мақсаты – өндірістегі адами капиталдың жағдайын анықтау және адами капитал мен инновация арасындағы байланысты табу. Дүниежүзілік банк әзірлеген және есептеген Адам капиталы индексінің корреляциялық және регрессиялық талдауы және 2020 жылы 127 елдің ДЗМУ әзірлеген және есептеген Жаһандық Инновация индексі. Талдаудың екінші бөлімі өңдеуші сектордағы адам капиталы болды. Ұлттық статистика бюросының екінші деректер 1991 жылдан 2020 жылға дейінгі кезеңге алынды. Біз жұмысшыларды гендерлік құрамы, гендерлік жалақы айырмашылығы, техникалық мамандықты бітірген бакалаврлар саны, қартаю және білімі бойынша талдадық. Қазақстанның 2020 жылғы НСИ төмендетілді, оның ықтимал себебі COVID-19 пандемиясының халықтың денсаулығы мен біліміне кері әсері болуы мүмкін. Жаһандық инновациялар индексі мен адам капиталы индексі арасындағы корреляция 0,86 құрайды. Өндіріс саласының қызметкерлері арасында 50% гендерлік алшақтық анықталды, бұл өсу үрдісін көрсетеді. Өңдеу өнеркәсібіндегі жұмысшылардың көпшілігінің бакалавр дәрежесі жоқ, яғни олар ой еңбегін емес, қол еңбегін орындайды. Бәлкім, елде қолданылатын инновацияны ұлғайту, тиісті білімі жоқ қызметкерлердің санын қысқартуы мүмкін, ал өндірістік сектордың өнімділігі артады. Дегенмен, жұмыссыздықтың да өсетінін ескеруіміз керек.

Түйін сөздер: экономика, адами капиталдың жинақталуы, адами капитал, интеллектуалды капитал, білімге негізделген экономика, өндіріс секторы, стратегия, инновация

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Человеческий капитал в инновационной экономике: промышленный сектор

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Аннотация

Человеческий капитал является ключевым фактором, определяющим экономическое развитие из-за высоких темпов научно-технического прогресса. Цель исследования - определить состояние человеческого капитала в промышленности и найти взаимосвязь между человеческим капиталом и инновациями. Для реализации данной цели был проведен корреляционный и регрессионный анализ Индекса человеческого капитала, разработанного и рассчитанного Всемирным банком, и Глобального инновационного индекса, разработанного и рассчитанного ВОИС для 127 стран в 2020 году. Второй частью анализа было определение текущего состояния человеческого капитала в промышленном секторе. Вторичные данные с Бюро национальной статистики были взяты за период с 1991 по 2020 гг. Мы проанализировали состав работников по гендерному составу, разнице в оплате труда мужчин и женщин, количеству выпускников бакалавриата технических специальностей, возрасту и образованию. Возможной причиной снижения Индекса человеческого капитала в 2020 году является побочное влияние пандемии COVID-19 на здоровье и образование населения. Корреляция между Глобальным инновационным индексом и Индексом человеческого капитала составляет 0,86. Выявлен 50% разрыв в гендерном соотношении у работников промышленности, который имеет тенденцию к росту и увеличивается. Большинство работников в промышленности не имеют высшего образования, что означает преобладание ручного труда, над умственным. Вероятно, увеличение используемых в стране инноваций может уменьшить количество работников без надлежащего образования, в то время как производительность промышленного сектора возрастет. Однако следует учитывать, что будет расти и безработица.

Ключевые слова: экономика, накопление человеческого капитала, человеческий капитал, интеллектуальный капитал, наукоемкая экономика, производственный сектор, экономика; стратегия, инновации

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Introduction

Human capital is a key determinant of economic development because of the rapid pace of scientific and technological progress. It leads to the introduction of manufacturing and the birth of new knowledge-based industries [1]. As far as economies started to invest in human capital, the shift to a knowledge-based economy has commenced. The high quality of human capital positively impacts the country's economic growth, especially in knowledge-based economies. Developing a knowledge-based innovation economy is impossible without skilled human capital. The power of an innovation economy is human capital, which is professional, has excellent hard and soft skills, experience, and productivity.

Currently, 1089,2 thousand employees (2020) are working in the manufacturing industry in Kazakhstan, while only 33% have a bachelor's degree[2]. The issue of human capital accumulation in the sectors is one of the complex problems to develop an innovative economy. Therefore, the research aims to define the state of human capital in the manufacturing industry; to find the link between human capital and innovation.

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 the economic boundary of these relationships. It also contributes to the further understanding 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 to understand the existing research and debates.

Second, we analyze the relationship between the Human capital index of the World Bank and the Global Innovation Index of WIPO.

Thirdly, we define the current state of human capital in the manufacturing industry in Kazakhstan, including regional distribution, aging, and education. It helps to understand and evaluate the current situation of human capital in the knowledge-based economy.

This study result implies to strengthen capacity and improve the competitiveness of human capital in the manufacturing industry, risk analysis of human capital accumulation policy.

Literature review

Economies have become knowledge-based in recent decades, while the economy of Kazakhstan is oil-reliant. Innovation is the driving force of the global economy, especially in the manufacturing sector [3]. The transformation to

the knowledge economy is in progress, and the only way to achieve it is diversification of the economy. It is known that the economics of Kazakhstan depends on the extraction and sale of minerals, while the share of high technologies is low. Changing the economy to industrial development requires increasing innovative activity, which depends on human and social capital. Despite the innovational capacity, which includes a high level of educated people, insufficient scale and speed of diffusion of innovations hinder the effectiveness of innovation policy[4].

Intellectual capital and intangible assets are important factors to flourishing in the knowledge-based economy. Private business abs innovation and develops employees' skills to work effectively [5]. Kolyadin [6] stated that intellectual capital is the sum of knowledge of all enterprise employees supporting its competitiveness.

Sachs and Warner[7, 8] discovered that countries with rich resources accumulate lower human capital. Resource-rich countries have enough workplaces for low-skilled workers with higher income, so the accumulation of high-quality human capital is limited. As a country with a resources-based economy, Kazakhstan is one of the examples of poor human capital accumulation. Only 33 % of the workforce has higher education, while the human capital index is relatively high (0,63)[9].

The case study of Ecuador showed that the oil boom negatively affects human capital accumulation but improves the infrastructure [10]. During the oil boom, the income of low-skilled employees was high despite the fact of education. In the economy of Kazakhstan, the effect of the oil boom was in the 2000s when the average nominal salary was \$ 503 (60805 KZT) in comparison with 1999 were \$99 (11864 KZT).

According to Razavi, SMJ et al. [11], human capital directly and positively affected the technological innovation capabilities of sport manufacturing companies. People with higher education can detect and assess business ideas. Leadership, motivation, and knowledge had advantages over other dimensions.

In the study of multi-country manufacturing firms of Li Ma, et al.[12], they have found that the impact of training on innovation is higher in a greater concentration of power and fast-growing economies.

Kozhabaeva, S.A., Mukan, B.G., and Yelshibayev R.K. [13], considered human capital at the macro level by gauging it with the Human development capacity index. They have included indices of poor and unemployability. According to the studies, economic growth doesn't

increase human capital, especially if we consider development of the national product growth in rich-resource countries.

Yessengeldin et al.[14] considered the human capital in single-industry towns and determined aging issue, where 18% of employers are at the retirement age. Gimranova R. mentioned the disbalance in the composition of specialized staff reasoned by low wages, which leads to the outflow of specialists [15]. However, between 2000 and 2020, the migration of people with technical backgrounds decreased from 2,3% to 0,4%.

Materials and Methods

The impact of innovation on the economy is excellent. However, any theory should be proved by testing.

Though, in this paper, we used mixed methods. We have used the quantitative method to approach the interrelation between human capital and innovation. The qualitative method approach analyses the grounded theory to see the existing research on the impact of innovation on human capital. So, we indicated our hypotheses that innovation and human capital are not correlated.

To see the relationship between human capital and innovation, we have chosen to do correlation and linear regression analysis. Suseno et al.(2018) performed the hierarchical regression analysis to define the effect of a country’s level of human capital on the country’s level of national innovation performance[16]. As variables were taken, the Human Capital Index (hereafter-HCI) was designed and calculated by the World Bank and Global Innovation Index (hereafter -GII), representing about 92% of the world’s population, designed and estimated by WIPO. The initial stage was taken 200 countries that provided the data in the year 2020. However, at data specification, 73 countries were eliminated from the analysis because of missing values of one of the indices. As a result, research is based on 127 countries worldwide for 2020.

The research procedure was the following: firstly, we conducted the correlation analysis; as soon as we interpreted it and saw the strong correlation, we started with the second step – regression analysis. At the same stage, we got a graphical image of the regression, description tables, including R, R-squared, deviation, ANOVA, and Coefficients and Standard errors, including the Fisher test. Then we have interpreted the tables of regression.

The second part of the analysis was the human capital in the manufacturing sector of the economy of Kazakhstan. The secondary data from the Agency for Strategic planning and reforms of the Republic of Kazakhstan Bureau of National statistics were taken. We have selected the number of employees in the sector and performed a time series analysis for the period from the year 1991 to the year 2020. Then we analyzed the composition of workers by gender for the period between 2016-2020. At the same time, we have tested the number of bachelors who graduated of technical major for the same time. Also, we have used the ILO method of the gender pay gap.

The following critical stage was employees’ education level and age to see the quality of human capital in the manufacturing industry.

Results and Discussions

Human capital is measured by different indices that include survival, quantity, quality of education, health growth, life expectancy, expected years of schooling, etc. (UN, WB). However, when we consider the quality of human capital in the industry, it is preferable to assess skills, experience, productivity, hard and soft skills, intellectual ability, and motivation[6].

Within the National report on competitiveness by Economic Research Institute, Kazakhstan has weak positions in education and science, health, and the labor market[17]. Life expectancy(55 in the IMD 2021 ranking) and expenditure on health(69 in the IMD 2021 ranking) is relatively low. Also, an index of university education (59 in the IMD 2021 ranking), reading, and STEM literacy(69 in PISA 2018) are common.

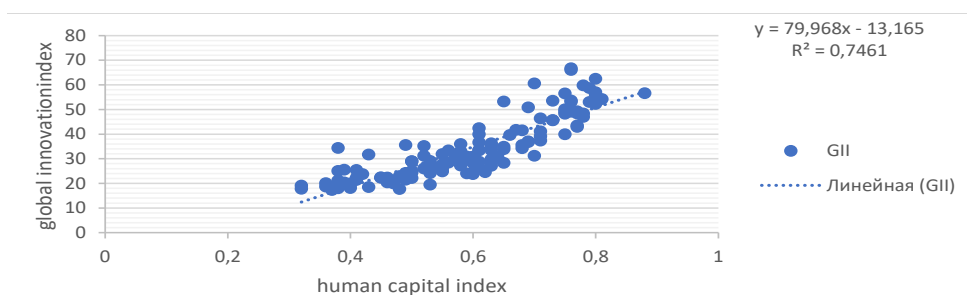


Figure 1 - The linear relationship between GII and HCI

Note: Made up by author based on World Bank Open Data

According to Figure 1, the Human capital index correlated strongly with the global innovation index (0,86). If the human capital index rises by 1 unit, the innovation index will increase to 79,9.

Table 1 demonstrated correct Standard error (6,36). According to R Square, 74% of global innovation index change depends on the human capital index, which means that the high level of human capital helps develop innovations.

Table 1 - Regression Statistics

Multiple R	0,86375446
R Square	0,74607176
Adjusted R Square	0,74404034
Standard Error	6,36480262
Observations	127

Table 2 - ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	14878,1695	14878,1695	367,265067	5,1228E-39
Residual	125	5063,83904	40,5107123		
Total	126	19942,0085			

F(367,265067) more than Significance F (5,1228E-39), therefore, the hypothesis about no relation between HCI and GII is rejected. Also,

we may conclude that the equation is significant because Significance F is less than the significance level.

Table 3 - Coefficients and Standard error

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95,0%</i>	<i>Upper 95,0%</i>
Intercept	-13,164658	2,5467188	-5,1692625	9,0454E-07	-18,204931	-8,1243855	-18,204931	-8,1243855
HC	79,9680282	4,17279046	19,164161	5,1228E-39	71,709558	88,2264984	71,709558	88,2264984

The coefficients in Table 4 show that the model fit looks positive. The regression intercept takes value 2,5467188, while the regression deviation for the human capital index takes value 4,17279046. P-value is less than 0,05, which means that both variables are statistically significant with a 95% confidence interval. The standard error for a and b is in the range of normal distribution and doesn't exceed 10%. Based on table 2,3 we concluded that the model is the fitted is significant.

Time series analysis showed that the accession rate of employees is – 28,9 with the base period 1991. The dramatic fall of employees was from 1991 through 2001.

Figure 3 indicates a vast gender ratio gap between manufacturing industry employees, which is more than 50%, and the gender ratio (men/women) of university graduates with technical education is 2, which requires future investigations. Also, the gender wage gap is 0,31 by ILO method in 2020.

According to Winters [18], STEM education positively affects society more than a person only. Also, the human capital of metropolitans impacts

the area of inhabitation and the boundaries. Therefore, the increasing number of STEM graduates is significant for policymakers because of the spillover effect. However, Robst [19, 20], Abel and Deitz, [21] defined that the impact of education is arguable. So, most graduates are not using their obtained education sufficiently, while others are overqualified for the positions. Therefore, the mono industry cities may suffer from knowledge spillover to other cities, as we can see in Karaganda region. Most of the employees are working in the Karaganda region, while the number of enterprises is less than in Almaty city and it is 1404 compared to 1661. The top 3 regions with the highest number of manufacturing enterprises are Almaty city, Karaganda, and the Akmola region[22].

Figure 4 shows that 33 % of employees have a bachelor's degree and higher, while about 50% of workers have only vocational secondary education. 15% has secondary education. It means that only 1/3 of the workers are highly qualified. As far as innovation and technology development, it will impact employees. While Say [23], Schumpeter [24] stated that developing

innovation would create new job positions, others [25, 26] argued that unemployment would grow up. Therefore, if the quality of human capital in

manufacturing stays the same, unemployment will increase. So, manufacturers should pay attention to the life-long learning to fulfill later on the new positions.

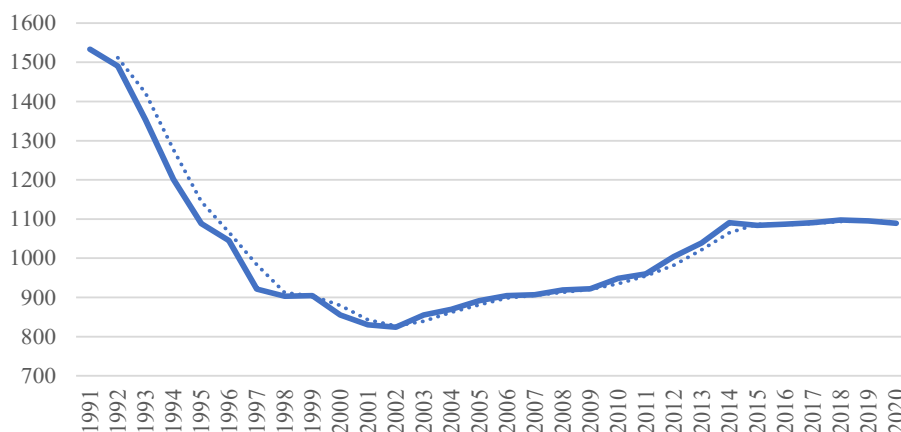


Figure 2 - Quantity of manufacturing industry employees, thous.

Note: Made up by author based on Governmental Statistics of the Republic of Kazakhstan

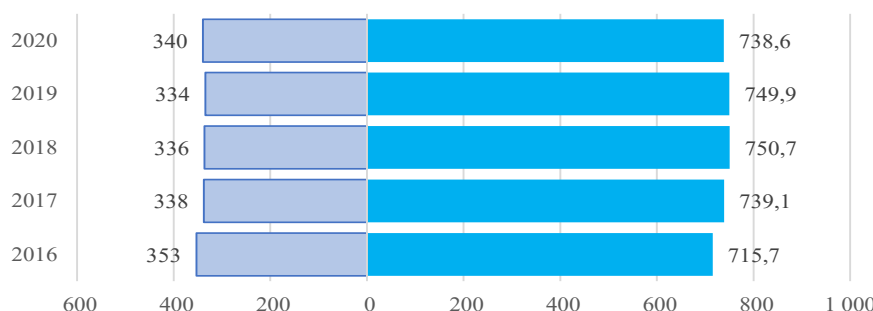


Figure 3 - Quantity of manufacturing industry employees by gender, thous., 2016-2020

Note: Made up by author based on Governmental Statistics of the Republic of Kazakhstan

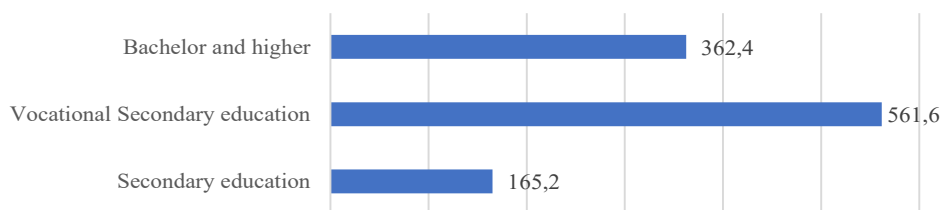


Figure 4 - Level of education of manufacturing industry employees, 2020.

Note: Made up by author based on Governmental Statistics of the Republic of Kazakhstan

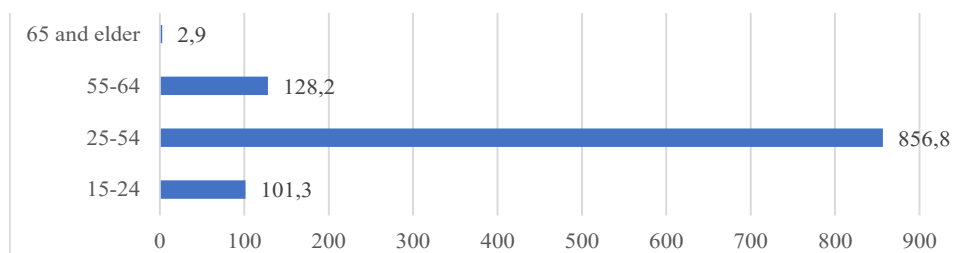


Figure 5 - Ageing of manufacturing industry employees, 2020.

Note: Made up by author based on Governmental Statistics of the Republic of Kazakhstan

Almost 80% of workers are between the age of 25-54 years, while 11% of employees are pre-pension age. 0,26% at the age of retirement. The aging shows the normal distribution of the labor force; however, according to Johnson [27], the efficiency of workers falls at the age 40-50 years old. At the same time, Jan C. van Ours, Lenny Stoeldraijer[28] agreed that aging would affect the composition of workers but argued that the future impact of increasing the ratio of old-age employees is not clear. Anyways, we should consider the aging of staff and how to avoid losing productivity in the industries.

According to Karavay[29], the specific human capital is defined by skills, including corporate culture and interaction with colleagues, which is usually gauged by work experience in the sphere. According to Smith [30], the size of income increases by obtaining work experience. However, in the manufacturing industry, the absence of data about employees' experience is the limitation of this paper.

Also, we should consider the change of employability in the future by developing such platforms as Metaverse, which will change not only the labor but also the economy. The technological literacy will probably become more desirable for the labor force in the whole world, and only countries with developed IT skills could participate in this competition.

Conclusion

According to analysis, HCI of Kazakhstan in 2020 is dropped, a possible reason for this is the COVID-19 pandemic's side effect on the health and education of the population. Based on the literature review that has been performed the population of resource rich countries are invested in their education less. Therefore, the high quality of human capital stands as a priority of any government at the macro level.

Also, according to neoclassical theory high quality of human capital improves and develops innovation. We have taken into account that the development of innovation has two sides. One is positive affects to employability by creating new, non-existent job position. On another hand, people are losing their jobs because of automatization of manufacturing processes. Also, to justify the relation of human capital and innovation we made the correlation and regression analysis. As subject of human capital, we have analyzed the human capital index, at the same period we have chosen global innovation index as indicator of innovation. The correlation analysis showed the strong connection between two variables, which equals to 0,86. According to R Square, 74% of global innovation index change depends

on the human capital index, which means that the high level of human capital helps to develop innovations. Hypothesis 1 stated that invention and human capital are not correlated. However, it was declined.

The next stage of analysis was to define the current state of human capital in manufacturing. The number of manufacturing industry employees and volume of manufacturing production are not correlated. During the research of manufacturing sector employee's composition, we have noticed, that most of the workers in the manufacturing industry do not have a bachelor's degree, which means that they perform hand labor rather than mental. Probably increasing the innovation used in the country may decrease the number of employees without proper education, while the productivity of the manufacturing sector will increase. However, we should take into account that unemployment will increase either.

1/10 of workers are at the pre-pension age, according to some researchers the aging of workers will affect to the productivity.

The 50% gender ratio gap is revealed in the employees of the manufacturing sector which shows an upward trend. Also, gender pay gap is 31%, which means that for doing the same type of work, male workers get higher income than female. This phenomenon will be researched in further investigations.

References

1. Avdeev, E.V. (2014). To the question of the economic essence and content of the category "human capital". *Bulletin of the Voronezh State Agrarian University*, 4(43), 115-123
2. Agency for Strategic planning and reforms of the Republic of Kazakhstan Bureau of National Statistics (2021) Manufacturing of the Republic of Kazakhstan. Statistical book. 2016-2020. Ed. Aydalapkelov, N.S. Nur-Sultan
3. Xin, J.Y., Yeung, C.L., & Cheng, T.C.E. (2010) First to market: is technological innovation in new product development profitable in health care industries. *International Journal of Production Economics*, 127(1), 129-135.
4. Spankulova, L.S., Chulanova, Z.K., & Ibraimova, S.Z. (2019). Influence of innovative activity, human capital, knowledge spillovers on regions's economic growth. *Economics: the strategy and practice*, 14(4), 53-66.
5. Baldini, M.A., Bronzetti, G., & Sicoli, G. (2017). *A Framework to Measure Intellectual Capital*. In: Bilgin M., Danis H., Demir E., Can U. (eds) *Country Experiences in Economic Development, Management and Entrepreneurship// Eurasian Studies in Business and Economics*. Springer, Cham. https://doi.org/10.1007/978-3-319-46319-3_32

6. Kolyadin, A. P. (2011). The structure of fictitious human capital. *Terra Economicus*, 9(2-3), 11-15.
7. Sachs, J.D., & Warner, A.M. (1999). The big push, natural resource booms and growth. *Journal of Development Economics*, 59, 43-76.
8. Sachs, J.D., & Warner, A.M., (2001). The curse of natural resources. *European Economic Review*, 45(4-6), 827-838. [https://doi.org/10.1016/s0014-2921\(01\)00125-8](https://doi.org/10.1016/s0014-2921(01)00125-8)
9. Demircug-Kunt, A., & Torre, I. *Measuring Human Capital in Europe and Central Asia*. Policy Research working paper, (2020) [updated October 11, 2021; cited July 12, 2021]. Available: <http://documents.worldbank.org/curated/en/988881603808037902/Measuring-Human-Capital-in-Europe-and-Central-Asia>
10. Mosquera, R. (2022). The long-term effect of resource booms on human capital. *Labour Economics*, 74, 102090.
11. Razavi, S.M.J., Talebpour, M., Azimzadeh, S.M., & Mohammadkazemi, R. (2019). Enhancing Technological Innovation Capabilities: The Role of Human Capital in Iranian Sports Manufacturing Companies. *Annals of Applied Sport Science*, 7(3), <https://doi.org/10.29252/aassjournal.734>
12. Ma, L., Zhai, X., Zhong, W., & Zhang, Z. X. (2019). Deploying human capital for innovation: a study of multi-country manufacturing firms. *International Journal of Production Economics*, 208, 241-253. <https://doi.org/10.1016/j.ijpe.2018.12.001>
13. Kozhabaeva, S.A., Mukan, B.G. & Yelshibayev R.K. (2021). Human Development in Kazakhstan: Problems and Methods of Analysis. *Economics: the Strategy and Practice*, 16(4), 174-187. <https://doi.org/10.51176/1997-9967-2021-4-174-187>
14. Yessengeldin, B., Dauletova, A., Serikova, G., & Daniyarova, M. (2019). Models of human capital development in single - industry towns of East Kazakhstan. *Bulletin of Karaganda University. Economy Series*, 95(3), 11-21.
15. Gimranova, R.R., & Aimagambetov, E.B. (2019). Human capital as an important benchmark for the development of the economy of Kazakhstan. *Jekonomicheskaja serija Vestnika ENU im. L.N. Gumileva*, 2, p. 26-32. <https://doi.org/10.32523/2079-620X-2019-2-26-32>
16. Suseno, Y., Standing, C., Kiani-Mavi, R., & Jackson, P. (2020). National innovation performance: the role of human capital and social capital. *Innovation: The European Journal of Social Science Research*, 33(3), 296-310. <https://doi.org/10.1080/13511610.2018.1536536>
17. National report on competitiveness. Kazakhstan in the international ranking (2021). *Economic Research Institute*, 6, (2021) [updated July 29, 2021; cited December 25, 2021]. Available: https://economy.kz/documents/Research_ERI/National_reports/National_Report_2021
18. Winters, J.V., (2014). STEM graduates, human capital externalities, and wages in the U.S. *Regional Science and Urban Economics*, 48, 190-198. <https://doi.org/10.1016/j.regsciurbeco.2014.07.003>
19. Robst, J. (2007). Education and job match: The relatedness of college major and work. *Economics of Education Review*, 26(4), 397-407. <https://doi.org/10.1016/j.econedurev.2006.08.003>
20. Robst, J. (2007). Education, college major, and job match: Gender differences in reasons for mismatch. *Education Economics*, 15(2), 159-175. <https://doi.org/10.1080/09645290701263070>
21. Abel, J.R., & Deitz, R. (2012). Do colleges and universities increase their region's human capital? *Journal of Economic Geography*, 12(3), 667-691.
22. Agency for Strategic planning and reforms of the Republic of Kazakhstan Bureau of National Statistics (2021). Employment in Kazakhstan. Statistical book, 2016-2020. N.S. Nur-Sultan
23. Say, J.B. (2009). *A Treatise on Political Economy or the Production. Distribution and Consumption of Wealth*. New York: BiblioBazaar.
24. Schumpeter, J.A. (2017). *The Theory of Economic Development*. New York: Routledge.
25. Wood, J.C. (2004). *Karl Marx's Economics: Critical Assessments*. London and New York: Routledge.
26. Feldmann, H. (2013). Technological Unemployment in Industrial Countries. *Journal of Evolutionary Economics*, 23, 1099-126.
27. Johnson, P. (1993). *Aging and European economic demography*, in: Johnson, P. and K.F. Zimmermann (eds.) Labor markets in an ageing Europe, Cambridge University Press.
28. Jan C., & Stoeldraijer, L., (2010). *Age, Wage and Productivity*. IZA Discussion Paper. <http://dx.doi.org/10.2139/ssrn.1556553>
29. Karavay, A.V., (2013). State and dynamics of the quality of human capital of Russian workers. *Terra Economicus*, 13(5), p. 144-158. <http://dx.doi.org/10.23683/2073-6606-2017-15-3-14>
30. Smith, A. (2000). *The wealth of nations. Introduction by Robert Reich; edited, with notes, marginal summary, and enlarged index by Edwin Cannan*. New York: Modern Library.

Список литературы (транслитерация)

1. Avdeev, E.V., (2014). To the question of the economic essence and content of the category "human capital". *Vestnik Voronezhskogo gosudarstvennogo agrarnogo universiteta*, 4(43), 115-123 (In Russ.)
2. Agency for Strategic planning and reforms of the Republic of Kazakhstan Bureau of National Statistics (2021) Manufacturing of the Republic of Kazakhstan. Statistical book. 2016-2020. Ed. Aydalapkelov, N.S. Nur-Sultan
3. Xin, J.Y., Yeung, C.L., & Cheng, T.C.E. (2010) First to market: is technological innovation in new product development profitable in health care industries. *International Journal of Production Economics*, 127(1), 129-135.
4. Spankulova L.S., Chulanova, Z.K., & Ibraimova, S.Z. (2019). Influence of innovative activity, human capital, knowledge spillovers on regions's

economic growth. *Economics: the strategy and practice*, 14(4), 53-66. (In Russ.)

5. Baldini, M.A., Bronzetti, G., & Sicoli, G. (2017). *A Framework to Measure Intellectual Capital*. In: Bilgin M., Danis H., Demir E., Can U. (eds) *Country Experiences in Economic Development, Management and Entrepreneurship// Eurasian Studies in Business and Economics*. Springer, Cham. https://doi.org/10.1007/978-3-319-46319-3_32

6. Kolyadin, A. P. (2011). The structure of fictitious human capital. *Terra Economicus*, 9(2-3), 11-15 (In Russ.)

7. Sachs, J.D., & Warner, A.M. (1999). The big push, natural resource booms and growth. *Journal of Development Economics*, 59, 43-76.

8. Sachs, J.D., & Warner, A.M., (2001). The curse of natural resources. *European Economic Review*, 45(4-6), 827-838. [https://doi.org/10.1016/s0014-2921\(01\)00125-8](https://doi.org/10.1016/s0014-2921(01)00125-8)

9. Demircuc-Kunt, A., & Torre, I. *Measuring Human Capital in Europe and Central Asia*. Policy Research working paper, (2020) [updated October 11, 2021; cited July 12, 2021]. Available: <http://documents.worldbank.org/curated/en/988881603808037902/Measuring-Human-Capital-in-Europe-and-Central-Asia>

10. Mosquera, R. (2022). The long-term effect of resource booms on human capital. *Labour Economics*, 74, 102090.

11. Razavi, S.M.J., Talebpour, M., Azimzadeh, S.M., & Mohammadkazemi, R. (2019). Enhancing Technological Innovation Capabilities: The Role of Human Capital in Iranian Sports Manufacturing Companies. *Annals of Applied Sport Science*, 7(3), <https://doi.org/10.29252/aassjournal.734>

12. Ma, L., Zhai, X., Zhong, W., & Zhang, Z. X. (2019). Deploying human capital for innovation: a study of multi-country manufacturing firms. *International Journal of Production Economics*, 208, 241-253. <https://doi.org/10.1016/j.ijpe.2018.12.001>

13. Kozhabaeva, S.A., Mukan, B.G. & Yelshibayev R.K. (2021). Human Development in Kazakhstan: Problems and Methods of Analysis. *Economics: the Strategy and Practice*, 16(4), 174-187. <https://doi.org/10.51176/1997-9967-2021-4-174-187>

14. Yessengeldin, B., Dauletova, A., Serikova, G., & Daniyarova, M. (2019) Models of human capital development in single - industry towns of East Kazakhstan. *Bulletin of Karaganda University. Economy Series*, 95(3), 11-21.

15. Gimranova, R.R., & Aimagambetov, E.B. (2019). Human capital as an important benchmark for the development of the economy of Kazakhstan. *Jekonomicheskaja serija Vestnika ENU im. L.N. Gumileva*, 2, p. 26-32. <https://doi.org/10.32523/2079-620X-2019-2-26-32> (In Russ.)

16. Suseno, Y., Standing, C., Kiani-Mavi, R., & Jackson, P. (2020). National innovation performance: the role of human capital and social capital. *Innovation: The European Journal of Social Science Research*, 33(3), 296-310. <https://doi.org/10.1080/13511610.2018.1536536>

17. National report on competitiveness. Kazakhstan in the international ranking (2021).

Economic Research Institute, 6, (2021) [updated July 29, 2021; cited December 25, 2021]. Available: https://economy.kz/documents/Research_ERI/National_reports/National_Report_2021

18. Winters, J.V., (2014). STEM graduates, human capital externalities, and wages in the U.S. *Regional Science and Urban Economics*, 48, 190-198. <https://doi.org/10.1016/j.regsciurbeco.2014.07.003>

19. Robst, J. (2007). Education and job match: The relatedness of college major and work. *Economics of Education Review*, 26(4), 397-407. <https://doi.org/10.1016/j.econedurev.2006.08.003>

20. Robst, J. (2007). Education, college major, and job match: Gender differences in reasons for mismatch. *Education Economics*, 15(2), 159-175. <https://doi.org/10.1080/09645290701263070>

21. Abel, J.R., & Deitz, R. (2012). Do colleges and universities increase their region's human capital? *Journal of Economic Geography*, 12(3), 667-691.

22. Agency for Strategic planning and reforms of the Republic of Kazakhstan Bureau of National Statistics (2021). *Employment in Kazakhstan*. Statistical book, 2016-2020. N.S. Nur-Sultan

23. Say, J.B. (2009). *A Treatise on Political Economy or the Production, Distribution and Consumption of Wealth*. New York: BiblioBazaar.

24. Schumpeter, J.A. (2017). *The Theory of Economic Development*. New York: Routledge.

25. Wood, J.C. (2004). *Karl Marx's Economics: Critical Assessments*. London and New York: Routledge.

26. Feldmann, H. (2013). Technological Unemployment in Industrial Countries. *Journal of Evolutionary Economics*, 23, 1099-126.

27. Johnson, P. (1993). *Aging and European economic demography*, in: Johnson, P. and K.F. Zimmermann (eds.) *Labor markets in an ageing Europe*, Cambridge University Press.

28. Jan C., & Stoeldraijer, L., (2010). *Age, Wage and Productivity*. IZA Discussion Paper. <http://dx.doi.org/10.2139/ssrn.1556553>

29. Karavay, A.V. (2013). State and dynamics of the quality of human capital of Russian workers. *Terra Economicus*, 13(5), p. 144-158. <http://dx.doi.org/10.23683/2073-6606-2017-15-3-14> (In Russ.)

30. Smith, A. (2000). *The wealth of nations. Introduction by Robert Reich; edited, with notes, marginal summary, and enlarged index by Edwin Cannan*. New York: Modern Library.

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