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A. Serikkyzy[1*], S.S. Baktymbet[2], A.S. Baktymbet[3]

[1]Almaty management university ALMAU, Almaty, Kazakhstan
[2,3]Kazakh University of Technology and Business, Almaty, Kazakhstan

[1]baktymbet.a@gmail.com, [2]sbaktymbet@gmail.com, [3]asem_abs@mail.ru

[1]https://orcid.org/0000-0002-3313-5417, [2]https://orcid.org/0000-0003-2439-3470,
[3]https://orcid.org/0000-0002-8441-71823

[1]Scopus Author ID: 57217830758, [2]Scopus Author ID: 57217830760, [3]Scopus Author ID: 57217830759

Measuring human capital's contribution to sustainable economic development

Abstract

Object: The object is research of human capital through education, healthcare, professional skills, social competencies, and their effect on economic sustainability and development.

Methods: The methodological basis of the work is comprised of quantitative methods including regression analysis and econometric modeling.

Findings: The following main results showcase human capital's significant and multifaceted impact on sustainable development parameters:

1) Education and healthcare investments have been revealed to contribute to an increase in productivity and economic growth.

2) Research leads to reduction in poverty and improvement of environmental indicators.

3) Human capital development policy making and implementation as an essential element of achieving sustainable economic development.

Conclusions: This section offers recommendations for politicians and government agencies on how to form strategies for the development of human capital. Results of the study can serve as a basis for the formation of effective strategies to develop human resources in the context of global economic and social challenges.

Keywords: human capital, sustainable development, human resources, education, skills, social and economic challenges, investments, competitiveness.

Introduction

In contemporary reality, both national and global communities can prosper in the long term only if such key elements as sustainable economic development are in place. Among many factors affecting economic sustainability, human capital takes a spotlight determining potential for innovation, productivity, and social inclusion. However, despite the recognition of its importance, methods for measuring human capital's contribution to sustainable development still spark intense debate and research.

The Fourth Industrial Revolution dictates direct dependance of the state's prosperity on the quality of human resources. That is exactly why comprehensive human capital development is of paramount importance.

That being said, education paradigm is in desperate need for changes. Education system's failure to meet modern requirements and, ergo, its stagnation is no surprise for scientists, both foreign and domestic.

This paper explores trends and issues of education system development, factors affecting human capital development in Kazakhstan, and their interaction with economic growth.

This paper is a comprehensive research with a goal to assess human capital's role and contribution to sustainability of economic systems. Authors define human capital through the prism of education, health, skills, and social competencies, investigate their impact on economic sustainability and development. Authors introduce a quantitative approach using regression analysis and econometric modeling to form methodological framework and to measure human capital's input to economic upswing and general welfare.

Above all else, the existing education system operates with the benefit of hindsight, focuses on past, occasionally obsolete, experience, and avoids future orientation (the so-called "supportive learning"), thus uncovering the essence of global education crisis.

As inevitable modernization of the education system is, it is also a no easy task. Meeting demands of the time is hard but also rewarding as it offers an ultimate transition to a way more effective and dynamic,

*Corresponding author's e-mail: *baktymbet.a@gmail.com*

innovative technology based education system, in which quality of human capital affecting economic advance plays a key role.

Literature Review

For more than two centuries, many economic theoreticians have been thoroughly familiarizing themselves with how human labor abilities develop, form, and apply. Even such prominent personalities as V. Petty (1971), A. Smith (1776), J.S. Mill (1859), and K. Marx (1867) saw useful developed human abilities as part of the concept of basic capital. That interest did not die by the 19th and 20th centuries, when the need and expediency of interpreting humans and their abilities as a peculiar form of basic capital have only grown further. The theory of human capital has only raised the stakes by making academic community accept human investment as a source of economic growth just as important as a more "common" capital investments. It was finally recognized as investment with a long-term, productive effect (Dyatlov S.A. 1994).

Having looked into various concepts of human capital, authors define it as a complex, multifaceted economic phenomenon with a whole multitude of forms. We believe human capital to represent a set of economic relations arising in social production between its subjects who explore how human abilities accumulate, develop, and improve.

The research literature focusing on human capital is vast and multidimensional. Such authors as Becker (1964) and Schultz (1961) have initiated a systematic analysis of education and health's role in economic growth. And still, there is a significant gap in research concerning specific mechanisms via which human capital affects various aspects of sustainable development. On top of that, questions remain how exactly to measure this contribution and which factors are most significant.

More recent studies emphasize the need for a comprehensive approach to human capital measurement that does not stop on traditional indicators, such as education and health, but also considers broader aspects, including social inclusion and innovation level (Nafukho et al., 2004; Sweetland, 1996). This notwithstanding, the existing measurement methodologies often disregard these aspects (Fraunhofer-Gesellschaft, 2023).

This study uses statistical data from the Ministry of Education and Science, the OECD and the World Bank (World Bank 2018, 2020, 2021), Kazinform (2019), National Chamber of Entrepreneurs of the Republic of Kazakhstan Atameken (2019), President's Messages to the people of Kazakhstan, Tokaev K-Z. (2023), Center for the Bologna Process and Academic Mobility of the Ministry of Education and Science of the Republic of Kazakhstan (2023), Bureau of national statistics agency for strategic planning and reforms of the Republic of Kazakhstan (2022), and scientific articles by A.S. Baktymbet, S.S. Baktymbet, A. Serikkyzy (2022).

This study assesses various aspects of human capital and their impact on sustainable economic development. Our findings once again stress importance education, health, skills, and social inclusion have given the fact how crucial they are for human capital. This conforms with all the previous studies in this field (Richard Wilkinson & Michael Marmot, 2003, Jeffrey Sachs, 2006).

Education has proven to have the greatest impact on economic development as recognized by many authors, including Gary S. Becker, (1964). Theodore W. Schultz, (1971), Robert J. Barro, (1997), Eric A. Hanushek (2008), Paul M. Romer (1990), and Amartya Sen (1999) who also identified education as a fundamental factor of economic growth.

In this regard, this study's key challenge is to develop and test an integrated model to measure human capital's contribution to sustainable economic development that considers both traditional and new factors. Based on the analysis of existing approaches and a critical literature review, the study aims to fill the gaps in knowledge about human capital and sustainable economic development interaction mechanisms.

That said, the research puts forward the following questions:

What indices can measure human capital's input in sustainable economic development most effectively?

How do different human capital components (e.g. education, health, skills, social inclusion) affect sustainable economic development in diverse contexts?

Does current interpretation of the relationship between human capital and sustainable economic development have any gaps and if it does, how can we fill them using new methodological approaches?

By answering these questions, this research offers a revamped theoretical and methodological concept for approaching and measuring the human capital's impact on sustainability of economic development.

Methods

The purpose of this study is to measure human capital's contribution to sustainable economic development. To achieve this goal, the following tasks have been defined: 1) Development of a comprehensive methodology to assess human capital's impact on sustainability of economic development, 2) Preliminary data collection and analysis to form an opinion on the state of human capital and sustainable development both worldwide and in Kazakhstan, and 3) Assessment of the relationship between human capital and sustainable development's main indicators.

The study uses a mixed methodological approach combining quantitative and qualitative analysis methods. Such statistical methods as regression analysis compile a quantitative approach while correlation analysis is all about measuring the relationships between human capital and sustainable development indices. A substantive analysis of economic documents, development strategies, and expert interviews is a centerpiece of a qualitative approach to comprehend contextual factors and ways human capital affects economic sustainability.

Data for the quantitative analysis has been collected from such international sources as the World Bank, the International Monetary Fund, the United Nations Development Program, and the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan. When applying qualitative approach, we resorted to interviewing experts on economic development and analyzed public records and development reports. Applying data analysis methods included the quantitative analysis as part of which we used SPSS, a software for statistical data processing, and thematic analysis methods for qualitative data processing.

Authors did not stop there and applied a new method implying the use of an integrated human capital index that combines both traditional and new dimensions of human capital, be it education, health, skills, or social inclusion with weights reflecting their relative impact on sustainable development. This index is designed to provide a more accurate measure of human capital's contribution to sustainable development and can be easily adapted for different countries and regions.

Results

The study has found educational level of the population, health indicators, skill indices, and social inclusion to be the most effective indicators for measuring human capital's contribution to sustainable economic development. Regression analysis has shown a significant positive correlation between these indicators and key indicators of sustainable development such as GDP per capita, environmental quality, and social equity.

The data analysis has shown how various human capital components affect sustainable economic development in variety of manners in different contexts. Education has proven to be the most significant factor for economic growth and improved environmental quality while population health was more closely related to social equity and poverty reduction. Skills and social inclusion have shown a strong positive effects on all sustainable development aspects while also dependant to different extent on regions and cultural context.

Frustratingly, the current interpretation of the human capital and sustainable economic development relation has gaps to it, as study shows, particularly with regard to the role of human capital's cultural and social aspects. Furthermore, both the existing data and methodologies fail to fully capture complex relationship between human capital and sustainable development components.

The state invests in human capital throughout a citizen's life, birth to death, mostly through social framework, e.g., education, healthcare, culture, physical development, recreation, etc. Human capital formed through this framework is designed to check all the modern innovative production's boxes.

Just like natural resources, initially, a citizen generates zero economic effect. It takes a certain amount of expenses, be it preparation, training, or skill development, to develop human resources that can generate plausible income, akin to physical capital.

This is to say that a citizen occupies a certain place in social production through self-organized activity or by selling labor to an employer which, in turn, takes their own physical strength, skills, knowledge, abilities, and talent. As such, human resources transform into active human capital under specific conditions and thus ensure realization of human potential in activities resulting in tangible economic effects.

Because of the state's constantly changing technological landscape, training of highly qualified staff must be assessed appropriately. We commend a whole multitude of higher educational establishments in industrially developed countries who have already implemented such educational models as "Continuous

Learning", "On-the-Job Training", variant training models, etc. Sadly enough, in our country, a point "One diploma for a lifetime" persists.

Current situation regarding continuous improvement of employee qualifications shows a gap between employer expectations and the actual employee competencies.

Previously, human capital would only refer to professional experience and knowledge, but later the concept has expanded to include the level of health, quality of life, family relationships, entrepreneurial and creative abilities, stress resilience, and energy potential.

Now, in the technological revolution era, an important part of human capital is the ability not only to integrate into the value chains of existing production but also to introduce innovations into the functioning links of economy.

Kazakhstan authorities attach significant importance to the aspect of human capital development in state programs. The Strategic Plan-2025 and the Concept of Kazakhstan's entry into the Top 30 of world's most developed countries identify national human capital as a core development driver of the 21st century.

A progress in the designated course of action is evident, the Human Development Index increase confirms this. In 2007, Kazakhstan ranked 73rd out of 177 countries, which corresponds to a country with a medium level of human development. Nine years later, in 2016, we finally moved up, securing the 56th position out of 188 countries, into the group of countries with a high level of human development. In 2020, it improved its ranking further to 55th place out of 157 countries worldwide.

Table 1. Human Capital Index for the Year 2020

Rank	Country	Index
1	Singapore	0.88
2	Hong Kong	0.81
3	Japan	0.80
41	Russia	0.75
45	China	0.68
55	Kazakhstan	0.65
155	South Sudan	0.31
156	Chad	0.30
157	Central African Republic	0.29
Note — compiled by the authors based on The Human Capital Index The World Bank (2020)		

Social work has gone through a radical transformation over the last couple of decades resulting in a way higher ability of each individual to add their own value in their respective roles against the backdrop of the country's transition from a "rental economy" to a "knowledge economy". Thuswise, human capital must be taken into consideration in combination with the production factor.

As compared to OECD countries, our current productivity level remains profoundly low, ultimately affecting the overall state competitiveness. Kazakhstan has been ranked 59th in the Global Competitiveness Index for two consecutive years (2017-2018). The USA this rating has been dominating for the past five years, followed by Singapore, Germany, Switzerland, and Japan. The report states Kazakhstan's competitiveness average for "Information and Communication Technologies" (44th place), "Goods Market" (57th place), and "Institutions" (61st place). On top of that, our other weak positions are "Health" (97th place) and "Innovation Potential" (87th place). "Education and Skills" suffered the biggest decline plummeting five positions to 57th place (World Bank 2018).

Growth rates of the aggregate productivity representing the sum of education, technology, employee qualifications, etc. contributions to the economy have been declining steadily over the last twenty years. The World Bank has estimated productivity sources to be strong at around 6 % in the early 2000s, consequently dropping to 2–3 % by the beginning of the 2010s, and finally turning negative later in 2014–2016.

Importantly, production growth gets hindered by a multitude of determining factors, one of which is the development technological level in manufacturing industry sectors. Case in point, the Fraunhofer Society for Integrated Circuits helmed research last year has shown that to this day more than 80 % of Kazakhstan's manufacturing industry enterprises resort to manual labor or semi-automated production (Fraunhofer-Gesellschaft, 2023).

Complementary to the need to expand automation of production and business processes, by 2030, digitization will force a whopping 75 to 375 million people worldwide to retrain or even change careers. Fur-

thermore, 11–12 years from now, children who started school last year will already be working professions that do not yet exist.

New economic challenges permeate the entire education system. In 2018, The UN Development Programme's literacy rate of people aged 15 to 24 ranked Kazakhstan 15th out of 155 countries (Kazinform, 2019).

Historically, developed countries are showing the largest number of people with Internet access (81 %). Half of that figure (40 %) go to developing countries, and it's only 15 % is in the least developed countries. In Kazakhstan, 77 % of population amounting to 13 million people enjoys Internet access. Further, it is 71 % of rural population and 81 % urban population (Baktymbet et al., 2022).

To further develop the education sector, the President has proposed new initiatives: to develop an educational model based on the "100 to 200" principle, to create a single "Top University" in each region of Kazakhstan approaching the Nazarbayev University standards, and to establish ten top colleges offering effective vocational education.

In various ways, current education system faces criticism, e.g., around 21,000 school graduates annually cannot enroll in vocational and higher education institutions, ultimately indicating low-quality school education. Furthermore, the National Chamber of Entrepreneurs Atameken's 2018 survey has shown 70 % of Kazakhstan employers feeling discontented with the level of university graduates' skills. Only 27.4 % of educational programs live up to employer expectations as a substantial part of educational program content is now obsolete and needs to be updated as soon as possible. Case in point, some IT students receive last-century Fortran APL training, which is barely used in the industry nowadays. As a result, at least 60 % of university graduates are forced to work jobs unrelated to their field (National Chamber of Entrepreneurs of the Republic of Kazakhstan Atameken, 2019).

Annual education reforms prove ineffective as mostly procedural aspects get amended. In addition to the reforms, higher education establishments need to prioritize adapting education to the business's and industry's practical needs.

Persistent underfunding is a major encumbrance to the education system's rejuvenation. In 2018, education sector enjoyed 1.95 trillion tenge of the state budget funds, which amounted to 3.2 % of GDP. In 2020, state support amounted to 3.14 % of GDP. All indications are that one per cent increase in education expenditures leads to a 0.35 % increase in GDP.

Table 2. Education Support from State Budget

Expenditures	2016	2017	2018	2019	2020	2021	2022
Volume of Education Expenditures (Billion Tenge)	1669.4	1843.2	1948.5	2332	3141.2	3681.9	4523.1
Budget Expenditure Volume (Billion Tenge)	9433.7	11567.7	10120.9	12019.9	14234.2	15207.2	18532.5
GDP (Billion Tenge)	46971.2	54378.9	61819.5	69532.6	70649	80302.1	82711.16
Share of Education Expenditures from Budget (Per Cent)	17.7	15.9	19.3	19.4	22.1	24.2	24.4
Share of Education Expenditures from GDP (Per Cent)	3.6	3.4	3.2	3.35	4.45	4.59	5.47
Note — compiled by the authors based on data from Bureau of national statistics agency for strategic planning and reforms of the Republic of Kazakhstan (2022)							

With this in view, the head of the state, Kassym-Jomart Tokayev, has instructed to increase education and science support to 5 % of GDP, which amounts to 1.1 trillion tenge in addition to the current expenditures (Tokayev K-Z., 2023). However, the financing procedure must follow a "smart" pattern and the distribution process must depend on requirements of the changing economy.

Higher education receives a significant amount of funding. Case in point, number of education grants increases annually. Specifically, in 2019, more than 53,000 grants have been allocated for undergraduate education, 13,000 for Master's programs, and over 2,000 for Doctoral programs (Center for the Bologna Process and Academic Mobility of the Ministry of Education and Science of the Republic of Kazakhstan, 2023).

There is no doubt our country is in need of more education grants. However, sooner or later, the lack of high requirements for their accessibility will create a mismatch between education and employer expectations. The result is obvious: invested funds cannot yield economic returns.

In 2018, over 8,000 grants have been awarded to pedagogical specialties with 80 % of the recipients scoring lower on the Unified National Testing (ENT) than the national average. Additionally, 4,076 recipients received grants with scores below the threshold of 50.

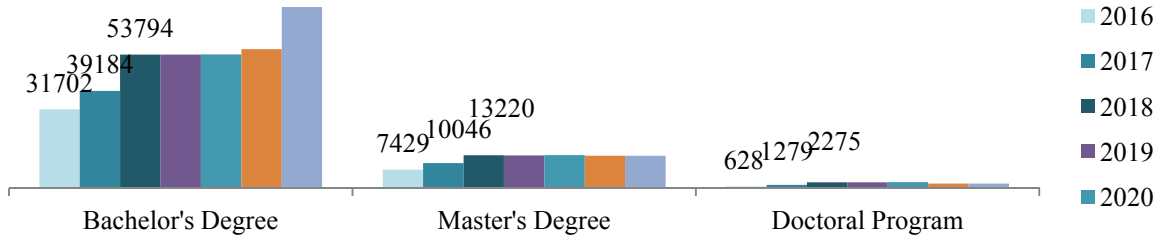

Figure 1. Number of Educational Grants

Note — compiled by the authors based on data from the Center for the Bologna Process and Academic Mobility of the Ministry of Education and Science of the Republic of Kazakhstan (2023)

To make matters even worse, low salaries render pedagogical specialties economically unattractive. This indicates a social character of education that is not considered a factor forming the economy.

Education system support must focus on teachers. In reality, schools, technical and vocational education institutions, and universities hire faculty members and offer salaries below the national average. At the peak of their careers, teachers make a maximum of 250,000 to 300,000 tenge. This includes both experience and academic degree bonuses.

If the teaching staff represents below-average updated human capital, knowledge transfer will not occur. Teachers are in desperate need of a starting career payment that cannot be lower than average salary in the country.

Considering economy's technological modernization, the demand for workforce in Kazakhstan is expected to surpass 570,000 people by 2025. An increase in the number of medium and highly qualified jobs will reach 766,000. A demand for low-skilled labor is expected to decrease (Center for the Bologna Process and Academic Mobility of the Ministry of Education and Science of the Republic of Kazakhstan, 2023).

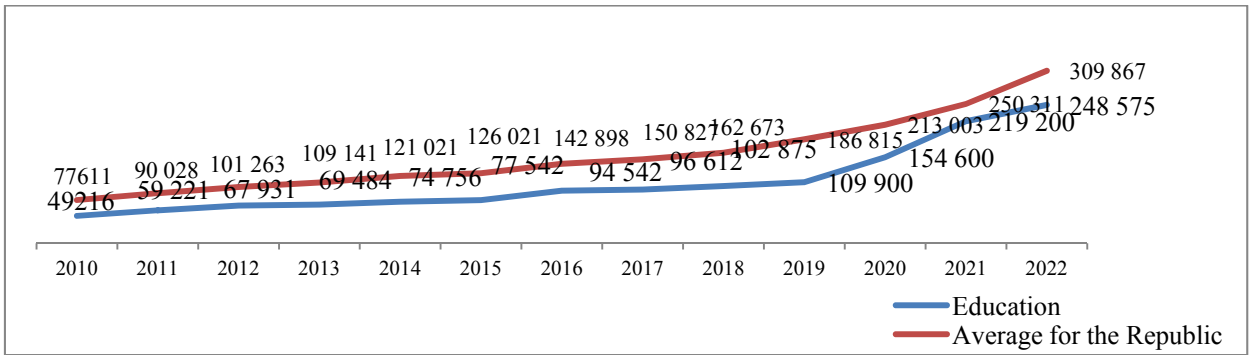

Figure 2. Average Annual Salary in the Education Sector

Note — compiled by the authors based on data from the Center for the Bologna Process and Academic Mobility of the Ministry of Education and Science of the Republic of Kazakhstan (2023)

To curb mass unemployment, first we need to further synchronize human potential supply and demand. Additionally, the global economy's needs and signals will help tremendously if kept close track of via a close relationship "Employer + University + School" and reacted proactively.

At the time being, the Ministry of Labor is pursuing to develop professional standards to make a significant input to improving professional and higher education system and the existing system of awarding qualifications. It should be realized that notwithstanding the importance of this work, there is still a lot to do because the standard handbook is only designed for the next five years while global economy challenges fluctuate much more frequently. For instance, a little while ago, major company managers in Kazakhstan would be required to have such skills as "project management", "change management", "leadership", and "working in cross-functional teams", and to further emphasize their management skills.

A highly paid competency leaderboard annually published by the European Union shows the decline of traditional skills and the diffusion of new technologies with traditional management disciplines. Relevant

competencies nowadays include "social media marketing", "digital finance", and "sales and product development", focusing on skills oriented toward the end product.

That is the very field that is in a desperate need for state support while the education system cannot favor just professional training when professional competency development is just as important.

To make matters worse, the "brain drain" reduces already implemented reforms to zero. 90 % of agriculture employees, 83 % education employees, and 64 % manufacturing employees suffer from subaverage wages. Disturbingly enough, only mining and financial activities can offer higher pay.

In a socio-political context, this trend makes employees and their families feel like their share of the wealth they create is not fair. Attempts to compensate for the missing income force individuals abroad to seek employment elsewhere. Each passing year sees the growing share of university-educated relocatees. Worse yet, most of in-movers have no higher education. In 2013, the figure was 30 % of all migrants. By 2017, it went even higher up to 40 %. 34.2 thousand people left our country in the first nine months of this year. Shockingly enough, it already makes 8.3 % more than in the same period last year.

The countries neglecting human capital when creating support policies will only see one-third or even half lower of their future generation workers' performance. In consequence of ongoing education system reforms, education sector support has been swinging up and down over the last decade. In 2018, investment decreased by 25 % amounting to 205.3 billion tenge. This year it is decreasing once again, with investment reaching only 92.8 billion tenge in the last seven months, which is 11 % lower than in same period in 2018 (103.3 billion tenge).

A ninefold bank loan volume reduction and a sixfold borrowed funds reduction appears to be the main reason for the decrease in this year's support. These funds' primarily source is the local budget, amounting to 34.6 billion tenge, 33.4 billion tenge of the republican budget, and 24.5 billion tenge of institutions' own funds.

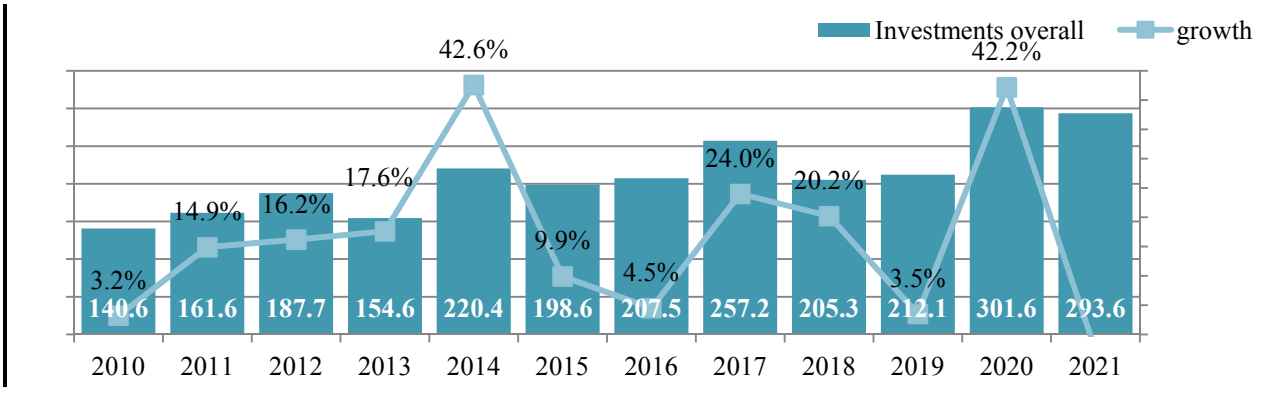

Figure 3. Relationship Between Education Investment Volume (Billion Tenge) and GDP Growth

Note — compiled by the authors based on data from Bureau of national statistics agency for strategic planning and reforms of the Republic of Kazakhstan (2022)

Primarily institutional changes play a major role in the country's innovative development strategy. They imply acquiring competencies, adapting skills, and adjusting institutions and organizations to new conditions in the development of technology, economy, and social life, as well as their ability to both facilitate or hinder positive changes in the economy.

An economically sound support that involves an enhanced investment policy is crucial for this kind of measure implementing.

To assess the development of human potential, we have developed a model calculating "Three Sources and Three Claims of Progress in Human Capital Development". To assess human capital development index as an alternative, we can use three sources of productivity — commodity, monetary, and country's labor resources. In this case, the research's direct result is the indicators of the return on the country's actual resource potential.

The first assertion, as a theorem of the commodity capital productivity X(t), is determined as the ratio of nominal GDP (NGDP) to intermediate consumption goods (QP):

$$\mu = \frac{NGDP}{QP} \quad \# (1)$$

Hence the corresponding scientific and technological progress coefficient (c) is determined, which is a function of the commodity capital resource productivity X(t) as follows:

$$c = \frac{\mu}{1+\mu} \#(2)$$

Further transformation of the scientific and technological progress coefficient (c) allows us to obtain of the following:

$$c = \frac{\mu}{1+\mu} = \frac{NGDP(t)}{QP(t) + NGDP(t)} \#(3)$$

Because they reflect the volume of sales of goods and services represented in the national accounts system by the output indicator X(t), we get the following:

$$NGDP(t) = c(t) \times X(t) \#(4)$$

Thuswise, the first statement-theorem of commodity capital productivity X(t) defines the nominal GDP NGDP(t) as a function of its resource potential product X(t) by the multiplier of scientific and technological progress c(t).

The second statement, as theorem of investment capital productivity TR(t), is determined by the ratio of personal consumption goods TW to investment capital TR:

$$\eta = TW \div TR \#(5)$$

Hence a corresponding estimate of progress in the currency-financial system (q) is determined, which is a function of the productivity of investment resources (TR) as follows:

$$q = \eta \div (1+\eta) \#(6)$$

Further transformation of the progress estimate in the currency-financial system (q), which is a function of the investment potential productivity η, allows us to obtain of the following:

$$q = \frac{\eta}{1+\eta} = \frac{TW}{TW + TR} \#(7)$$

Because according to the statement, TW+TR represents NGDP, we get the following:

$$TW(t) = q(t) \times NGDP(t) \#(8)$$

Thuswise, the second statement-theorem of progress in the development of investment capital occurs, which defines the magnitude of personal consumption goods TW(t) as a function of its resource potential product NGDP(t) by the multiplier of progress in the development of currency and financial system q(t).

The third statement, as the theorem of the human capital resource development productivity, is facilitated by the fact that nominal GDP NGDP(t), thanks to the coefficient of NTP c(t), is expressed in the volumes of sales of goods and services X(t). Therefore, by substituting for NGDP(t) its expression determined through the NTP indicator c(t), we obtain a model for personal consumption fund development in the final product structure in the actual physical expression TW(t) as follows:

$$TW(t) = g(t) \times c(t) \times X(t) \#(9)$$

Thuswise, the third statement-theorem of progress in the development of human capital occurs, which defines the magnitude of goods and services for personal consumption in the natural-material form TW(t) as a function of its resource potential product X(t) by the multiplier of progress in the development of both commodity and investment capital: $q(t) \times c(t)$.

Because the model of personal consumption fund development in the final product structure in actual product terms is defined by the following formula:

$$TW(t) = g(t) \times c(t) \times X(t) \#(10)$$

The cost of goods and services per person-hour of work for employed individuals in each country's economy on average is determined by the models defined at:

– the current cost of nominal NGDP: $\gamma(t) = g(t) \times \varphi(t)$, and

– the cost of sales volume X: $\gamma(t) = g(t) \times c(t) \times \psi(t)$,

where

$\gamma = TW \div L$ is the cost of one hour of labor per person-hour of work,

$\varphi = \frac{NGDP}{L}$ is aggregate labor and capital productivity, and

$\psi = X \div L$ is labor productivity by the cost of labor and capital determined considering the cost of intermediate consumption goods and services.

In general, the theorem is resulting in an equilibrium between the human capital development based on the aggregate productivity of labor and capital on one hand, and its development based on the productivity of the cost of goods and services on the other.

The provided systemic assessment of labor and capital productivity, despite qualitative differences in the factors of determination, ensures an equal level of human capital development in terms of cost TW, therefore:

$$q(t) \times \varphi(t) = q(t) \times c(t) \times \psi(t) \#(11)$$

Or, in terms of L(t, i) person-years of labor (with a constant working day duration for the type of activity (i)):

$$g(t,i) \times \varphi(t,i) \times L(t,i) = q(t,i) \times c(t,i) \times \psi(t,i) \times L(t,i) \#(12)$$

The presented systematic assessment of labor and capital productivity, despite qualitative differences in the factors of determination, ensures an equal level of human capital development in terms of cost TW, therefore:

$$g(t,i) \times \varphi(t,i) = q(t,i) \times c(t,i) \times \psi(t,i) \#(13)$$

Or, in terms of L(i) person-years of labor (with a constant working day duration for the type of activity (i)):

$$\sum\nolimits_{t}^{t} = \frac{T}{1} q(t,i) \times \varphi(t,i) \times L(t,i) = \sum_{t}^{t} = \frac{T}{1} q(t,i) \times c(t,i) \times \psi(t,i) \times L(t,i) \ \#(14)$$

Discussions

This study assessed various aspects of human capital and their impact on sustainable economic development. Our findings once again highlight the importance of education, health, skills, and social inclusion as human capital's key components. We fully endorse previous studies in this field (Richard Wilkinson & Michael Marmot, 2003, Jeffrey Sachs, 2006).

Education has shown to have the greatest impact on economic development as reflected in the works by many authors including Gary S. Becker (1964), Theodore W. Schultz (1971), Robert J. Barro (1997), Eric A. Hanushek (2008), Paul M. Romer (1990), and Amartya Sen (1999) who also identified education as a fundamental factor of economic growth. However, by contrast, our study has found a stronger correlation between higher education and economic development, which may indicate changing dynamics of education's influence in the context of globalization and technological change and digital development.

In the context of health, our results are consistent with the findings of scholars emphasizing its importance for sustainable development. However, our study further expands these conclusion by clearly showing how better health does not just directly increase labor productivity, but also improves social equity and decreases poverty.

Speaking of skills and social inclusion, our study's findings add to the existing literature by pointing to the complexity of their interaction with economic development. In particular, we found social inclusion to have a more pronounced impact on sustainable development in contexts with high levels of inequality. This finding offers a new perspective compared to Putnam, R. D. (2000), Fukuyama, F. (1995), Stiglitz et. al (2010), and Castells M. (1996) who did not fully regard social inclusion as a separate component of human capital.

Critical analysis of the findings in the context of published secondary data has clearly shown several gaps in current understanding of relationships between human capital and sustainable development. Our study reveals the need for a deeper analysis of the cultural and contextual factors that may modify or enhance these relationships.

In conclusion, results of our study confirm and extend previous theoretical and empirical knowledge on human capital's role in sustainable economic development. They also emphasize the need for continued research in this field with particular focus on interdisciplinary approaches and global context.

Conclusions

In contemporary reality where economy has been seriously shaken by the crises of 2008 and 2015, COVID-19 countries have slowed their GDP growth rates down. As a result, wellbeing of the commonwealth has decreased, and people, feeling the situation deteriorating, have started migrating, which ultimately leads to a decline in population growth.

Resource-based countries have lost their dominance because oil prices depend on volatility of world prices. These countries suffered worse effects of the crisis than others. We see a diversified economy as the only way out of the said crisis. Developed countries initiated this process quite quickly while developing countries lagged behind a bit. As for resource-based countries, economies of which are highly dependent on natural resources, they are still on their paths to diversification.

The human capital and the economy's innovative sector's role and magnitude have once again been underlined by the global economic crisis. Countries that risked it all by putting a stake on the human capital's competitiveness are now coming out of the crisis easier and suffer way less consequences.

This study's input to perception of human capital's role in sustainable economic development is tangible enough to notice. Our conclusions have confirmed education, health, skills, and social inclusion to be the core drivers of a more sustainable economic development. These results further highlight importance of human capital support if we are to pursue a more prosperous and sustainable economic future.

The practical relevance of this study is to provide sound recommendations for policy-making in education, health, and social inclusion. The results of the study can be used by governments and international organizations to design sustainable development strategies that consider human capital's contribution. Additionally, presented data and methodological approaches can serve as a basis for a deeper analysis of the relationship between human capital and economic growth at both national and international levels.

While significant contributions have been made to understanding of the relationship between human capital and sustainable economic development, this study has revealed a number of issues that require further analysis. In particular, there is a need for a more detailed examination of mechanisms through which different components of human capital affect different aspects of sustainable economic development in different cultural and socio-economic contexts. The issue of developing and adapting new methodological approaches to measure and analyze human capital in a rapidly changing global economic landscape remains relevant as well. Future research could also focus on assessing the effectiveness of different human capital development strategies and policies in achieving sustainable development goals.

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References

Baktymbet, A.S., Baktymbet, S.S., & Serikkyzy, A. (2022). The impact of education on the economic growth of Kazakhstan. *Bulletin of the Karaganda University. Economy Series*, 2, 21–33.

Barro, R. J. (1997). *Determinants of Economic Growth: A Cross-Country Empirical Study*. UK. Cambridge, MA: MIT Press.

Becker, G. S. (1964). *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. Chicago: University of Chicago Press.

Becker (1964). *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. New York: Columbia University Press.

Bureau of national statistics agency for strategic planning and reforms of the Republic of Kazakhstan (2022). Astana. Retrieved from https://stat.gov.kz/ru/industries/business-statistics/stat-invest/.

Castells M. (1996). *The Rise of the Network Society, The Information Age: Economy, Society and Culture*. Cambridge, MA; Oxford, UK: Blackwell, Vol. 556.

Center for the Bologna Process and Academic Mobility of the Ministry of Education and Science of the Republic of Kazakhstan (2023). Analytical Report on the Implementation of the Principles of the Bologna Process in the Republic of Kazakhstan. Kazakhstan, Astana. Retrieved from https://enic-kazakhstan.edu.kz/uploads/additional_files_items/28/file_en/analiticheskiy-otchet-final-14–12–2018–1.pdf.

Dyatlov, S.A. (1994). *Fundamentals of Human Capital Theory*. Russia, SPb: SPbUEF.

Fraunhofer-Gesellschaft (2023). Zur Förderung der angewandten Forschung e.V. Fraunhofer Institute for Systems and Innovation Research. Retrieved from https://www.fraunhofer.de/en.html.
Fukuyama, F. (1995). *Trust: The Social Virtues and The Creation of Prosperity*. USA.New York: Free Press, 457.
Hanushek, E. A., & Woessmann, L. (2008). The Role of Cognitive Skills in Economic Development. *Journal of Economic Literature, 46*(3) 607–668. USA.
Jeffrey, D. Sachs (2006). *The End of Poverty: Economic Possibilities for Our Time*. UK. Penguin Books.
Kazinform (2019). Kazakhstan ranks 15th in the world in youth literacy rate. Kazakhstan.Astana: Kazinform. Retrieved from https://www.inform.kz/ru/po-urovnyu-gramotnosti-molodezhi-kazahstan-zanimaet-15-e-mesto-v-mire_a3490855.
Marx, K. (1867). Das Kapital. Germany: Verlag von Otto Meissner.
Mill, J.S. (1859). On Liberty. United Kingdom, London: John W. Parker and Son.
Nafukho, F.M., Hairston, N., & Brooks, K. (2004). Human capital theory: Implications for HRD practice. *Human Resource Development International, 7*(2), 545–551.
National Chamber of Entrepreneurs of the Republic of Kazakhstan Atameken (2019). Ranking of Educational Programs of Higher Education Institutions. Kazakhstan, Astana. Retrieved from https://atameken.kz/ru/services/44-rejting-obrazovatel-nyh-programm-vuzov.
Petty, V. (1971). *Political Arithmetick*. United Kingdom, Bradford: The Harvester Press.
Putnam, R. D. (2000). *Bowling Alone: The Collapse and Revival of American Community*. USA. New York: Simon & Schuster, 544.
Richard Wilkinson & Michael Marmot (2003). Social conditions and health. Convincing Evidence. Second edition. Denmark, Copenhagen. WHO Regional Office for Europe.
Romer, P. M. (1990). Endogenous Technological Change. USA. University of Chicago Press. *Journal of Political Economy, 98*(5), S71-S102.
Schultz, T. W. (1971). *Investment in Human Capital: The Role of Education and of Research*. USA, New York: Free Press.
Schultz. (1961). Investment in Human Capital. *The American Economic Review, 51*(1), 1–17.
Sen, A. (1999). *Development as Freedom*. USA. New York: Anchor Books.
Smith, A. (1776). An Inquiry into the Nature and Causes of the Wealth of Nations. United Kingdom, London: Methuen & Co.
Stiglitz, J. E., Sen, A., & Fitoussi, J.-P. (2010). *Mismeasuring Our Lives: Why GDP Doesn't Add Up*. USA. New York: The New Press, 144.
Sweetland. (1996). Human Capital Theory: Foundations of a Field of Inquiry. *Review of Educational Research, 66*(3), 341–359.
Tokaev, K.-Z.K. (2023). Address of the Head of State to the People of Kazakhstan. Kazakhstan, Astana. Retrieved from https://www.akorda.kz/ru/addresses/addresses_of_president/poslanie-glavy-gosudarstva-kasym-zhomarta-tokaeva-narodu-kazahstana.
World Bank (2021). The Human Capital Index. UPDATE 2020. Human Capital in the Time of COVID-19. International Bank for Reconstruction and Development. USA. Washington.
World Bank. (2018). "Kazakhstan. Overcoming Productivity Stagnation". Retrieved from https://www.worldbank.org/en/country/kazakhstan/overview.
World Bank (2020). *The Human Capital Index. Update 2020*. USA. Washington, International Bank for Reconstruction and Development.

А. Серікқызы[1], С.С. Бақтымбет[2], Ә.С. Бақтымбет[3]

[1] Алматы менеджмент университеті, Алматы, Қазақстан;
[2,3]Қазақ технология және бизнес университеті, Алматы, Қазақстан

[1]baktymbet.a@gmail.com, [2] sbaktymbet@gmail.com, [3]asem_abs@mail.ru

[1]https://orcid.org/0000–0002–3313–5417, [2]https://orcid.org/0000–0003–2439–3470,
[3]https://orcid.org/0000–0002–8441–71823

[1]Scopus Author ID: 57217830758, [2]Scopus Author ID: 57217830760, [3]Scopus Author ID: 57217830759

Адами капиталдың тұрақты экономикалық дамуға қосқан үлесін өлшеу

Аңдатпа:

Мақсаты: Мақаланың мақсаты экономикалық жүйелердің тұрақтылығына адами капиталдың рөлі мен үлесін бағалау.

Әдісі: Жұмыстың әдістемелік негізі регрессиялық талдау мен эконометрикалық модельдеуді қоса алғанда, сандық әдістерге негізделген.

Қорытынды: Зерттеудің негізгі нәтижелері адами капиталдың тұрақтылық параметрлеріне айтарлықтай және өзіндік әсерін көрсетеді:

1) Білім беру мен денсаулық сақтауға инвестициялар еңбек өнімділігін арттыруға және экономикалық өсуге ықпал ететіні анықталды.

2) Жүргізілген зерттеу кедейліктің төмендеуіне және экологиялық көрсеткіштердің жақсаруына әкеледі.

3) Тұрақты экономикалық дамуға қол жеткізудің маңызды элементі ретінде адами капиталды дамытуға бағытталған саясатты әзірлеу және іске асыру.

Тұжырымдама: Қорытындыда адами капиталды дамыту стратегияларын қалыптастыруға бағытталған саясаткерлер мен мемлекеттік құрылымдарға арналған ұсыныстар берілген. Зерттеу нәтижелері жаһандық экономикалық және әлеуметтік сын-қатерлер контексінде адам ресурстарын дамытудың тиімді стратегияларын қалыптастыруға негіз бола алады.

Кілт сөздер: адами капитал, тұрақты даму, адами ресурстар, білім, кәсіби дағдылар, әлеуметтік және экономикалық мәселелер, инвестициялар, бәсекеге қабілеттілік.

А. Серікқызы[1*], С.С. Бақтымбет[2], Ә.С. Бақтымбет[3]

[1]Алматинский университет менеджмента, Алматы, Казахстан;
[2,3]Казахский университет технологии и бизнеса, Алматы, Казахстан

[1]baktymbet.a@gmail.com, [2] sbaktymbet@gmail.com, [3]asem_abs@mail.ru

[1]https://orcid.org/0000–0002–3313–5417, [2]https://orcid.org/0000–0003–2439–3470,
[3]https://orcid.org/0000–0002–8441–71823

[1]Scopus Author ID: 57217830758, [2]Scopus Author ID: 57217830760, [3]Scopus Author ID: 57217830759

Измерение вклада человеческого капитала в устойчивое экономическое развитие

Аннотация:

Цель: Целью данной статьи является оценка роли и вклада человеческого капитала в устойчивость экономических систем.

Методы: Методологическая основа работы основана на количественных методах, включая регрессионный анализ и эконометрическое моделирование.

Результаты: Основные результаты исследования демонстрируют значительное и многогранное влияние человеческого капитала на параметры устойчивого развития:

1. Было выявлено, что инвестиции в образование и здравоохранение способствуют повышению производительности труда и экономическому росту.

2. Проведенное исследование приводит к сокращению бедности и улучшению экологических показателей.

3. Разработка и реализация политики, направленной на развитие человеческого капитала как важнейшего элемента достижения устойчивого экономического развития.

Выводы: В заключение представлены рекомендации для политиков и государственных структур, направленные на формирование стратегий развития человеческого капитала. Результаты исследования могут послужить основой для формирования эффективных стратегий развития человеческих ресурсов в контексте глобальных экономических и социальных вызовов.

Ключевые слова: человеческий капитал, устойчивое развитие, человеческие ресурсы, образование, профессиональные навыки, социальные и экономические проблемы, инвестиции, конкурентоспособность.