



# THE ROLE OF QUALITY OF EDUCATION IN ENSURING THE SECURITY OF BIOSOCIAL ESSENCE: CHALLENGES FOR ENGINEERING OF INDUSTRY 4.0 TECHNOLOGIES

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ABSTRACT

*Quality of higher education, Provision of security, Biosocial essence, Socio-investment model of economic growth, Sustainable Development Goals (SDGs), Engineering of Industry 4.0 technologies*

*The research aims to investigate the role of education in the security of the biosocial essence of a person in the implementation of the socio-investment model of economic growth. This research focuses on the concept of the biosocial perspective in the unity of the well-being of humans as a biological species (satisfaction of biological needs) and their position in society (satisfaction of social needs). In the social and investment model of economic growth, the management tool is investments in the increase in the quality of higher education services, and the process of human development is comprised of biosocial phenomena, social connections (social lifts through obtaining higher education) and context (return of investments in higher education). The authors conducted an econometric study based on correlation analysis. This method is used to determine the relationship between the quality of higher education and official employment, the accessibility of employment and career building for young people (absence of ageism), the gender neutrality of society and the economy, and the absence of poverty. The key conclusion of the research is that the quality of higher education plays an important role in the security of the biosocial essence of a person during the implementation of the socio-investment model of economic growth. This paper also discovered challenges for the engineering of Industry 4.0 technologies, which are connected with the necessity for technological support for the most successful execution of the role of the quality of education in the employment of youth as the central element of ensuring the security of biosocial essence in the conditions of the Fourth Industrial Revolution. The novelty of the research lies in the clarification of the causal links between sustainable development and the disclosure of human potential from the perspective of the security of the biosocial essence of a person in support of the implementation of the Sustainable Development Goals (SDGs). The contribution of the research consists of developing a toolkit to implement the socio-investment model of economic growth and thereby improve the manageability and efficiency of this process. The social significance of the research is that it demonstrated the possibility and feasibility and provided a scientific and methodological basis for the systemic implementation of SDG 1, SDG 4, SDG 5, and SDG 8.*



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## 1. INTRODUCTION

The socio-investment model of economic growth relies on the development and disclosure of the human potential of the economic system (Adeleye et al., 2022; Pourehtesham, 2022). However, the targeted positive effect in the form of an acceleration of economic growth can only be achieved if the human potential is unlocked in an economically efficient manner (Duan et al., 2022; Wang et al., 2022). Thus, to implement the socio-investment model of economic growth, it is necessary to satisfy human needs (self-fulfilment) and use them as a human resource of the economy (Fuchs, 2022; Iglesias et al., 2022; Letzel-Alt et al., 2022; Mitchell et al., 2022). The line between these manifestations of human development is blurred and should be clarified to make economic growth in the social-investment model more predictable and manageable.

The meaning of social investments is disclosed in the biosocial approach, the central element of which is the concept of the biosocial essence of a person (Schwartz et al., 2019). This concept defines humans as a biological species and as a subject of society (Glenn and McCauley, 2019). Through the lens of this concept, social investments are investments that allow, at the same time, improving the biological existence of humans and their social positions (Pitts-Taylor, 2019). Thus, when implementing the social and investment model of economic growth, the priority is support for the security of the biosocial essence of a person (Pais, 2019).

The paper aims to investigate the role of the quality of education in the security of the biosocial essence of a person in the implementation of the socio-investment model of economic growth. Special attention in this paper is paid to challenges for the engineering of Industry 4.0 technologies, which is a source of technological support for the execution of the role of the quality of education in the employment of youth as the central element of ensuring the security of biosocial essence in the conditions of the Fourth Industrial Revolution.

The novelty of the research lies in the clarification of the causal links between sustainable development and the disclosure of human potential from the perspective of the security of the biosocial essence of a person in support of the implementation of the Sustainable Development Goals (SDGs). The contribution of the research consists of developing a toolkit to implement the socio-investment model of economic growth and thereby improve the manageability and efficiency of this process.

The following design was chosen for this research. This introduction is followed by a literature review and gap analysis. It considers sustainable development and

unlocking human potential as the basis for implementing a socio-investment model of economic growth. It reveals the importance of the security of the biosocial essence of a person for sustainable development and the unlocking of human potential. The authors analyze the current practice of ensuring the security of the biosocial essence of a person.

Further, the materials and methodology of the research are presented. This is followed by a presentation and discussion of the research results, which are also discussed in comparison with the existing literature. The research ends with a conclusion that draws key findings, notes the limitations of the research, and provides ideas for future research.

## 2. LITERATURE REVIEW AND GAP ANALYSIS

### 2.1 Sustainable development and unlocking human potential as a basis for implementing the socio-investment model of economic growth

This research draws on the concept of human potential. In accordance with this concept, the need to unlock the human potential for the implementation of the socio-investment model of economic growth is noted and emphasized in numerous works, including Ahmed et al. (2020), Dankyi et al. (2022), Mohamed (2020), Nguyen (2022), Popkova (2021). Nevertheless, it remains unclear exactly how to ensure sustainable development and unlock human potential. This is a gap in the literature due to which the implementation of the social investment model is a so-called “black box” that has human development as input and economic growth as an output (Ogbeifun and Shobande, 2022).

The uncertainty of cause-and-effect relationships between sustainable development and human development hinders the development of management tools and reduces the overall manageability and effectiveness of implementing the socio-investment model of economic growth. This research seeks to fill the identified gap. In this connection, the research poses the following research question. RQ: How can we ensure sustainable development and unlock human potential to realize a socio-investment model of economic growth?

### 2.2 Significance of the security of the biosocial essence of a person for sustainable development and unlocking human potential

A content analysis of the available literature reveals the importance of the security of the biosocial essence of a person for sustainable development and unlocking human potential (Table 1).

**Table 1.** Importance of the security of the biosocial essence of a person for sustainable development and unlocking human potential

Manifestation of the biosocial essence	Interpretation of the biosocial essence of security	Contribution of biosocial security to the implementation of the socio-investment model of economic growth	SDGs
Employment	Formal employment	Tax and pension contributions to the state budget and the protection of workers' labour rights support economic growth	SDG 8
Building a career for young people	Accessibility of employment and career building for young people (no ageism)	Unlocking the human potential of young people as the most creative workers contributes to the innovative development of the economy	SDG 10
Economic activity with a potential gender gap	Gender-neutral society and economy	Full involvement of women in economic activity increases human development and accelerates economic growth	SDG 5
Talent application for income generation	Employment guarantees the absence of poverty and social financial security	The absence of poverty and sufficiency of income promotes spending as an investment in the economy that supports growth	SDG 1

Source: Developed by the authors.

As demonstrated in Table 1, this research identifies four manifestations of the biosocial essence of a person. The first manifestation is employment (Vallanti and Gianfreda, 2021). In this case, the security of the biosocial essence is interpreted as official employment (Williams, 2015). The contribution of biosocial security to the implementation of the socio-investment model of economic growth is that tax and pension contributions to the state budget and the protection of labour rights of employees support economic growth. This ensures the implementation of SDG 8.

The second manifestation is career-building for young people (Ahn et al., 2022). In this case, the security of the biosocial essence is interpreted as the availability of employment and career building for young people (absence of ageism) (Melak and Derbe, 2022). The contribution of the security of biosocial essence in the implementation of the socio-investment model of economic growth is that the disclosure of the human potential of young people as the most creative workers contributes to the innovative development of the economy. This ensures the implementation of SDG 10.

The third manifestation is an economic activity with a potential gender gap (Chordiya and Hubbell, 2022). In this case, the security of the biosocial essence is interpreted as the gender neutrality of society and the economy (Koskinen Sandberg, 2017). The contribution of biosocial security to the realization of the socio-investment model of economic growth is that the full involvement of women in economic activity increases human potential and accelerates economic growth. This ensures the implementation of SDG 5.

The fourth manifestation is the application of talents to generate income (de Lima et al., 2022). In this case, the security of the biosocial essence is interpreted as the fact that employment and employment guarantee the absence of poverty and social financial security (Gnagey, 2020). The contribution of biosocial security to the realization of the social investment model of economic growth is that the absence of poverty and sufficiency of income promotes spending as an

investment in the economy that supports its growth. This ensures the implementation of SDG 1.

### 2.3 Current practices for ensuring the safety of the biosocial essence of a person

The existing practice of ensuring the security of biosocial essence assumes that the subject of its provision is the state (Müller, 2020; Williamson et al., 2018), which implements a collective approach to ensuring the security of a biosocial entity, that is, ensuring the security of all its citizens or certain social categories at once (Chiapperino and Paneni, 2022; Methun et al., 2022). The activity of law enforcement (Calzada, 2022; Tsulukidze et al., 2019), aimed at implementing each highlighted SDGs separately, serves as a tool to ensure the security of biosocial essence. Thus, official employment is secured through the fight against the shadow economy (Borrego et al., 2022).

Accessibility of employment and career building for young people (no ageism) is ensured through the rationing of the age composition of workers in enterprises, targeted training with subsequent work at enterprises, and other measures (Cojocararu et al., 2022). Gender neutrality of society and the economy is ensured by increasing the social inclusiveness of society (Cameron et al., 2021). Poverty is combated by expanding social guarantees of the state (e.g., payments to the poor or unemployment benefits) and general social and labour policies (e.g., setting a minimum wage depending on the standard of living) (Arriani and Chotib, 2021).

The close connection between the engineering of Industry 4.0 technologies and labour conditions in the Fourth Industrial Revolution is discussed in detail and emphasized in many works of the following authors: Anvari and Anvari (2023), Kondrashov et al. (2023), Yangailo et al. (2023), and Yapa and Fernando (2023).

#### **2.4 The theory of the biosocial essence and effectiveness of social investments in the quality of higher education**

Simultaneously, the existing literature also provides individual evidence of the important role of the quality of higher education in unlocking human potential. The theory of the biosocial essence of a person points to the close connection between biological phenomena and social connections and contexts, which constitute the basis for human development (Hayes-Conroy et al., 2022; Mitchell-Sparke et al., 2022). This is vividly seen in Maslow's pyramid. At the lowest level of the pyramid, there are physiological (biological) needs, such as hunger, clean water, and sanitation. The social context of this level is poverty. To satisfy biological needs, it is necessary to fight poverty – as a social context (Harris and McDade, 2018).

The next level of the pyramid of needs determines the need for safety. The biological essence of this need consists in psychological sustainability, anxiety, or, on the contrary, confidence in tomorrow. The social essence of these needs is connected with the moods in society. For example, under the conditions of an economic crisis, social tension grows. Similarly, during industrial revolutions, quick rises of technological progress lead to opposition to innovations and social protest against changes. That is, for a human, as a biological species, to feel safe, there is a need for a favourable socio-economic and political context (Youdell, 2016).

The needs of other, higher, levels of the pyramid, have an initial social nature. At that, the well-being of a human as a biological species – access to resources, position in society – depends on his social status and presence of social lifts, which are largely determined by higher education (Tian et al., 2022). In the theory of the biosocial essence of a person, an important place belongs to the effectiveness of social investments in higher education (Methun et al., 2022).

University education in itself is one of the key social investments, for it allows raising the competitiveness of a person as an employee in the labour market (Patrinos et al., 2021). The effectiveness of social investments in higher education is a ratio of the advantages of higher education, which cannot be achieved in case of its absence (possibility to occupy managing positions, better opportunities for career building, increased social guarantees, more comfortable jobs, and increased wages) to expenditures for university education (state expenditures for the financing of higher education, employers' expenditures for corporate training of employees, students' expenditures for higher education, and lost profit from early employment in case of shorter educational programmes of the alternative – secondary vocational education) (Xie and Rice, 2021).

As a result of the content analysis of the existing literature, a potentially important role of higher education in ensuring the security of each distinguished (Table 1) component of the biosocial essence of a person was discovered. The successfulness of the execution of this role defines the effectiveness of higher education as a tool for managing the security of the biosocial essence of a person in the social and investment model of economic growth.

The first component of the security of the biosocial essence of a person is official employment. Berritella (2015) notes that a high level of education contributes to a greater resistance of workers to shadow employment and a greater propensity of workers to assert their labour rights. That is, higher education increases the power of employees in the labour market, as well as their awareness and ability to use this power. Employees with higher education are more inclined toward participation in unions and protection of their legal rights in the labour inspectorate if their rights are violated by employers. Moreover, employees with higher education take the employer's text of the labour agreement not for granted but as an option, which is subject to discussion and revision.

The second component of the security of the biosocial essence of a person is the accessibility of employment and career building for youth (absence of ageism). Dereli (2022) points out that the higher the level of education of young people, the greater their competitiveness in the labour market and, therefore, the higher their chances of employment. Access to employment for young people is the central aspect of the essence of a human of biosocial character, increasing possibilities for social investing.

This is explained by the fact that, on the one hand, youth is the most vulnerable category, which does not have property insurance pillow in case of poverty, long-term employment, or stable incomes. On the other hand, youth are most attractive for social investments, for they have the largest capabilities to return investments in higher education.

The third component of the security of the biosocial essence of a person is gender neutrality of society and economy. Lucchese et al. (2022) indicate that the higher the level of education, the more progressive the society. Women with higher education are more valuable in the labour market, and more educated employers are more willing to hire them. Due to this, higher education provides women equal opportunities with men, as the same biological species and equal subjects of society (Brigstocke et al., 2023).

The fourth component of the security of the biosocial essence of a person is employment and work that guarantees the absence of poverty, and financial protection. Yassine and Bakass (2022) argue that the

higher the level of education, the higher the level of income and the lower the poverty level in society and the economy. Thus, employees with higher education can take managing positions and have highly-efficiency and highly-paid jobs, which are inaccessible for employees without higher education.

The performed literature review emphasized the importance of the quality of higher education for ensuring the security of the biosocial essence of a person. Based on the arguments cited and confirmed by the existing literature, this research puts forward the following hypothesis H: Quality of higher education plays an important role in the security of the biosocial essence of a person. To find an answer to the set RQ and test the proposed hypothesis H, the research examines the links between the quality of higher education and the security components of the biosocial essence of a person.

### 3. MATERIALS AND METHODS

The research methodology implies the determination of the connection between the quality of higher education and the designated components of the security of the biosocial essence of a person: 1) official employment; 2) accessibility of employment and career building for youth (absence of ageism); 3) gender neutrality of society and economy; 4) employment and work, which guarantee the absence of poverty and the social and financial protection.

To determine the role of education in the security of the biosocial essence of a person, this research conducts an econometric study relying on the method of correlation analysis. The preference for the chosen method is explained by the fact that the studied variables are not strictly hierarchical (not divided strictly into factors and

results), being interdependent. Therefore, the use of regression analysis in this research can lead to erroneous results and their distorted interpretation, while the method of correlation analysis is optimal.

In this paper, the potential source for ensuring the security of the biosocial essence is higher education, which indicator is the level of development of higher education (“High Education” according to Knowledge for all, 2022). The components of the security of the biosocial essence of a person, through the lens of which the effectiveness of investments in higher education during the implementation of the social and investment model of economic growth is assessed, are as follows:

- Official employment, which indicator is “Share of informal employment by country (in percent)” according to the International Labour Organization (2022a);
- Accessibility of employment and career building for youth (absence of ageism), which indicator is the “Level of unemployment among youth” according to the International Labour Organization (2022b);
- Gender neutrality of society and economy, which indicator is “The Global Gender Gap Index” according to the World Economic Forum (2022);
- Employment and work guarantee the absence of poverty and social and financial protection, which indicator is “Income share held by lowest 20%” according to the World Bank (2022).

The research variables are defined in Table 2.

**Table 2.** Variables for the research

Type of variables	Essence of variables	Indicator	Source of statistics
Components of the security of biosocial essence	Formal employment	Share of informal employment by country (%)	International Labour Organization (2022a)
	Accessibility of employment and career building for young people (no ageism)	Youth unemployment rate	International Labour Organization (2022b)
	Gender-neutral society and economy	The Global Gender Gap Index	World Economic Forum (2022)
	Employment guarantees the absence of poverty and social financial security	Income share held by the lowest 20%	World Bank (2022)
Potential source of the security of biosocial essence	Higher education	Level of development of higher education	UNDP RBAS and MBRF (2022)

Source: Developed by the authors.

As demonstrated in Table 2, for each component of the security of the biosocial essence of a person, the corresponding indicator is selected from official statistics from authoritative and reliable sources. The procedure of data collection involves the determination of the circle of official indicators of international statistics that fit this research, with further formation of a sample of countries for which the values of all these indicators are available. The criterion for the inclusion

of countries in the research sample was the absence of gaps in statistics. As a result, 20 countries were selected, ensuring a sufficiently large and representative sample due to the fact that these countries represent different parts of the world.

Given the variables for the research, which were selected in Table 2, hypothesis H implies the following potential connections between education and security of

the biosocial essence of a person. An increase in the quality of development of high education should lead to the following: 1) Decrease in the share of informal employment by country (in percent); 2) Decrease in the unemployment rate among youth; 3) Increase in the global gender gap index; 4) Decrease in the income share held by lowest 20%.

## 4. RESULTS

### 4.1 System view of the role of the quality of education in ensuring the security of the biosocial essence of a person

To determine the role of the quality of education in the security of the biosocial essence of a person, the authors

conducted research based on the following empirical framework (Table 3).

A correlation analysis of the data in Table 3 led to the following results. When the level of development of higher education increases, the following is observed:

- The share of informal employment declines: the correlation is -37.81%;
- The youth unemployment rate increases: the correlation is 10.28%;
- The global gender gap index increases: the correlation is 11.48%;
- Poverty level (income share held by lowest 20%) decreases: the correlation is -22.58%.

**Table 3.** The empirical basis of the research.

Countries	Level of development of higher education, points 1–100	Share of informal employment (%), the latest year	Youth unemployment rate, %	The Global Gender Gap Index, score 0–1	Income share held by the lowest 20%
Argentina	48.99	48.9	17.77	0.756	4.8
Bosnia and Herzegovina	48.04	20.7	28.47	0.71	7.5
Brazil	41.48	39.2	22.62	0.696	4.5
Vietnam	35.32	70.4	5.29	0.705	6.7
Dominican Republic	46.37	57.3	14.56	0.703	6.2
Colombia	45.36	63.2	21.17	0.71	2.8
Costa Rica	45.04	40.8	30.11	0.796	4
Mexico	44.36	57.1	6.96	0.764	5
Mongolia	39.66	43.2	14.3	0.715	7.9
Pakistan	41.24	84.3	10.33	0.564	9.6
Panama	53.3	55.7	20.03	0.743	3.6
Peru	47.7	68.4	8.95	0.749	4.8
North Macedonia	47.71	9.9	27.72	0.716	6.1
Rwanda	29.49	87.1	22.07	0.811	6
Serbia	46.55	18.3	19.46	0.779	6.4
Turkey	32.93	29.9	19.95	0.639	5.4
Chile	46.59	27.4	15.92	0.736	5.5
Ecuador	43.23	68.6	8.38	0.743	4.1
El Salvador	34.91	69	8.24	0.727	6.3
South Africa	40.06	41.6	45.99	0.782	2.4

Source: Compiled by the authors based on the materials of the International Labour Organization (2022a, 2022b), UNDP RBAS and MBRF (2022), World Bank (2022), and World Economic Forum (2022).

This confirms that higher education plays an important role in the security of the biosocial essence of a person – contributes to the improvement of almost all its components.

### 4.2 In-depth analysis of the role of the quality of education in employment of youth as the central element of ensuring the security of the biosocial essence in industry 4.0

A warning signal is the discovered absence of a clear direct connection (strong correlation) between the quality of higher education and biosocial aspects, in particular, of employment, among youth. Though higher education contributes to the attempts to develop human potential, it does not explain the connections with the opportunities for employment for youth. As a matter of

fact, access to employment for young people is the central aspect of the biosocial character, increasing the opportunities for social investing. To explain the reason for the absence of guaranteed and obvious contribution of higher education to the development of the potential of youth in the sphere of support for implementing the social and investment model of economic growth, let us perform additional research, which will enhance the results obtained above.

Let us consider whether the degree of connection between the market of higher education and the labour market influences the significance of higher education for the employment of youth. The economic sense of this additional research consists, first, in the fact that the upgrade of higher education programmes may lag behind the changes in the labour market, which

accelerated against the background of the Fourth Industrial Revolution, which spread around the world. Thus, instead of the necessary support, higher education might hinder employment. Thus, higher education may cause increased and even false expectations of university graduates concerning their competitiveness in the labour market.

University education in itself, in case of the mismatch between educational programmes of universities and realities of the labour market, might not ensure the entire range of actual competencies, which are in demand by employers. Because of this, youth – university graduates – without work experience are less attractive candidates for hiring compared to experienced personnel, who have the entire range of theoretical and practical competencies.

Second, in the case of a serious mismatch between the activities of universities and business, university graduates, who are young personnel, may set increased and unattainable – in practice – requirements for work conditions. Thus, for example, digital personnel may require that workplaces be equipped with the newest devices. Green personnel may require compliance with too high environmental standards, which are not yet achieved by businesses.

Due to this, employees can refuse vacancies that are available in the labour market. Highly-skilled personnel may agree only to knowledge-intensive jobs and refuse low-tech employment. Here it is also necessary to take into account the tendency for total automatization in Industry 4.0, at which the most technically complex and even managerial business processes are subject to automatization based on robots and artificial intelligence.

This tendency leads to the general reduction of the economy's needs for personnel with higher education. At that, the total volume of demand for human resources in the economy may remain unchanged and even grow due to the increase in the need for personnel with secondary vocational education, i.e., low-skilled personnel. University graduates may refuse jobs for low-skilled personnel, for this does not allow returning investments in higher education, which is especially important during the research of the social and investment model of economic growth.

Students' investments in higher education include not also the direct payment for services of higher education with paid education but also lost profit in the form of under-received work experience and wages in the case of preference for alternative – secondary vocational education. Accordingly, choosing favour of higher education, youth desire better work conditions, opportunities for career building, expanded social

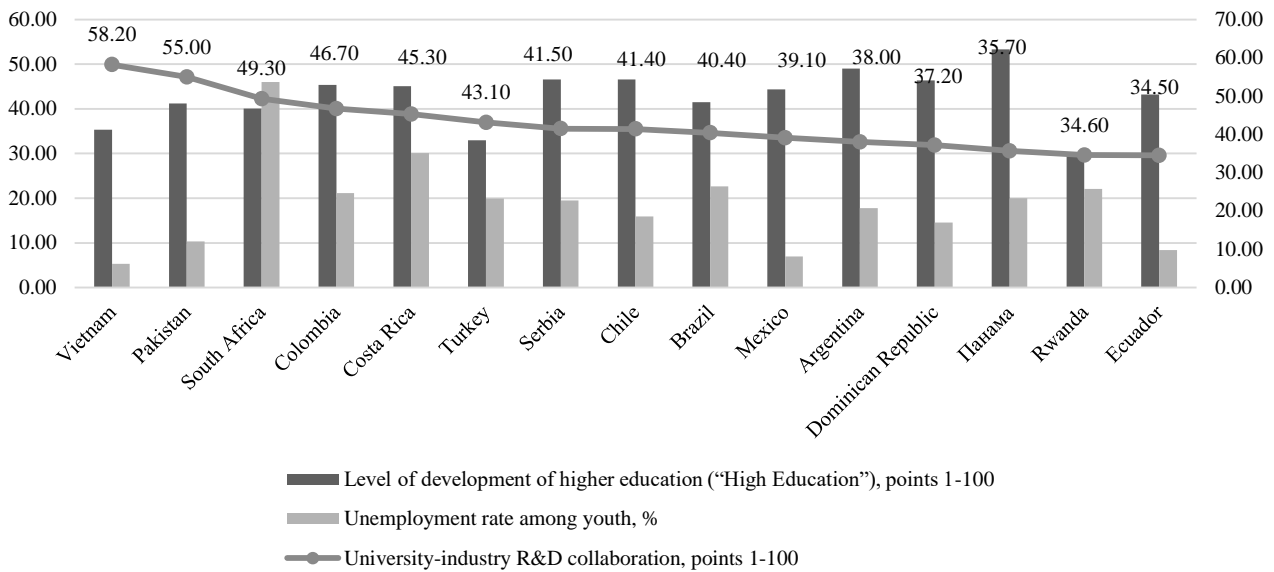
guarantees, and increased wages compared to jobs meant for low-skilled personnel.

The difference in quality and financial work conditions at workplaces for highly skilled and low-skilled personnel is the return on investments in higher education. If there is no return, investments in higher education are not received back and are unprofitable. That is why, young personnel among university graduates are ready to wait for a good opportunity for employment in the speciality and strive toward better work conditions, not quicker employment. This may lead to a higher unemployment rate among university graduates compared to graduates of secondary vocational education establishments.

Thus, higher education may increase the imbalance of the labour market, causing an increase in requirements for work conditions and wages from the offer – youth among university graduates – and, at the same time, the mismatch between youth's abilities and requirements of employers in the sphere of applied competencies from demand. To determine whether the described phenomenon is really observed in practice, let us identify the differences between the connection of higher education and the employment of youth in countries that have different degrees of connection between the market of higher education and the labour market. For this, countries of the sample are placed in the order of the decrease of the degree of connection of university-industry R&D collaboration in 2022. This allowed selecting the top 15 countries of the sample with the close connection between the market of higher education and the labour market (Figure 1).

As a result of correlation analysis of the statistics from Figure 1, it was determined that in the top 15 countries of the sample with the highest level of university-industry R&D collaboration in 2022, an increase in the level of the development of higher education (“High Education”) leads to a decrease in the unemployment level among youth: the correlation is -3.27%. This means that the degree of connection between the market of education and the labour market is the key condition for the positive contribution of higher education to support foremployment of youth among university graduates as the central element of ensuring the security of the biosocial essence of a person.

Thus, the results obtained discovered challenges for the engineering of Industry 4.0 technologies, which are connected with the necessity for technological support for the most successful execution of the role of the quality of education in the employment of youth as the central element of ensuring the security of biosocial essence in the conditions of the Fourth Industrial Revolution.



**Figure 1.** The top 15 countries of the sample in the order of the decrease in the degree of connection of university-industry R&D collaboration in 2022.

Source: created by the author based on the International Labour Organization (2022b), Knowledge for all (2022), WIPO (2023).

## 5. DISCUSSION

The contribution of the research to the literature is that it develops the scientific provisions of the concept of human potential by clarifying its cause-and-effect relationships. The research identified the mechanism of sustainable development and unlocking human potential, according to which the quality of higher education contributes to the economic-efficient

disclosure of human potential through the security of biosocial essence. Due to the fact that there is not only the realization of needs but also a highly efficient use of human resources, it provides an accelerated and successful implementation of social and investment models of economic growth. The differences between the results obtained and the existing literature are shown in table 4.

**Table 4.** The results obtained in comparison with the existing literature.

Criterion for comparison	Existing literature		Results obtained in this research
	Scientific thesis	References	
The subject of the security of biosocial essence	State	Müller (2020) and Williamson et al. (2018)	A person as the possessor of a biosocial essence
The approach to securing a biosocial essence	Collective	Chiapperino and Paneni (2022), and Methun et al. (2022)	Individual
A tool to secure a biosocial essence	Activities of law enforcement agencies	Calzada (2022) and Tsulukidze et al. (2019)	Obtaining graduate degree
The way to achieve the SDGs in the implementation of the socio-investment model of economic growth	Separately	Arriani and Chotib (2021), Borrego et al. (2022), Cameron et al. (2021), and Cojocarú et al. (2022)	Systemic implementation of SDG 1, SDG 4, SDG 5, and SDG 8

Source: Developed by the authors.

As is shown in Table 4, in contrast to Müller (2020) and Williamson et al. (2018), this research proves that to maximize the contribution to the realization of a socio-investment model of economic growth, the individual, not the state, must act as the subject of the security of biosocial essence. In contrast to Chiapperino and Paneni (2022) and Methun et al. (2022), the authors proposed an alternative approach to the security of biosocial essence – individual rather than collective.

Higher education has been proposed as a promising tool for securing a biosocial entity, as opposed to the law enforcement activities recommended by Calzada (2022)

and Tsulukidze et al. (2019). In contrast to Arriani and Chotib (2021), Borrego et al. (2022), Cameron et al. (2021), and Cojocarú et al. (2022), during the implementation of the socio-investment model of economic growth, it is recommended to implement SDG 1, SDG 4, SDG 5, and SDG 8 systemically – through ensuring the safety of the biosocial essence of a person with the support of higher education.

The theoretical contribution of this paper is that it supports the ongoing scientific discussion on the topic of the theory of the biosocial essence of a person, disclosing the cause-and-effect relationships of



social investments through the receipt of quality higher education and the security of the biosocial essence. The author's conclusions strengthened the evidence base of the point of view of Berrittella (2015), Dereli (2022), Lucchese et al. (2022), and Yassine and Bakass (2022) that the quality of higher education should be assessed from the position of its contribution to ensuring the security of the biosocial essence of a person.

## 6. RECOMMENDATION AND SOLUTION

The obtained results and conclusions allow offering the author's recommendations on the improvement of the biosocial policy of the state, which include the following:

- Increase in state expenditures for higher education as a mechanism of implementing the social and investment model of economic growth;
- Monitoring of the quality of higher education by the criteria of the share of informal employment, the unemployment rate among youth, gender neutrality of society (the global gender gap index), and the poverty level (income share held by lowest 20%);
- Monitoring of the quality of university management by the criteria of the share of informal employment, the unemployment rate among youth, gender neutrality of society (the global gender gap index), and the poverty level (income share held by lowest 20%);
- Stimulation of social investments of business through an increase in its expenditures for corporate training of employees, connected with receipt of higher (including second higher) education;
- Stimulation of social investments of society through the strengthening of cultural values of higher education;
- Development of institutes that ensure social lifts for employees with higher education;
- Stimulation of university-industry R&D collaboration to establish a better connection between the market of higher education services and the labour market to support the employment of youth among university graduates.
- Technological support for the execution of the role of the quality of education in the employment of youth as the central element of ensuring the security of biosocial essence in the conditions of the Fourth Industrial Revolution through the engineering of Industry 4.0 technologies.

The practical implementation of the set of the author's recommendations will allow raising the effectiveness (return on investments) of higher education due to maximisation of the contribution to ensuring the security of the biosocial essence of a person.

## 7. CONCLUSION

The key conclusion of the research is that higher education plays an important role in the security of the biosocial essence of a person during the implementation of the socio-investment model of economic growth. The theoretical significance of these results is that they establish a link between the security of the biosocial essence of a person and the implementation of the socio-investment model of economic growth.

The research also redefines the components of the biosocial essence of a person and their security from the perspective of the SDGs. Taken together, this made it possible to reveal the black box and provide clarity and high controllability of the socio-investment model of economic growth through higher education, which determines the practical significance of the author's conclusions and recommendations.

The practical significance of the research lies in the fact that the author's recommendations have provided a diversification of tools to ensure the safety of the biosocial essence of a person. In addition to the activities of state law enforcement agencies, it is recommended to involve higher education, which will be an additional and effective lever of influence on sustainable development and the unlocking of human potential in the economy. The social significance of the research is that it demonstrated the possibility and feasibility and provided a scientific and methodological basis for the systemic implementation of SDG 1, SDG 4, SDG 5, and SDG 8.

Challenges for the engineering of Industry 4.0 technologies are as follows: on the one hand, it has to ensure the digital modernisation of companies, and, on the other hand, create knowledge-intensive and highly efficient jobs for employees with a high level of education (highly skilled personnel). Thus, the engineering of Industry 4.0 technologies must ensure flexible automatization, which, at the same time, serves the interests of all stakeholders, including employees, to guarantee social and labour lifts that are based on quality education.

However, the performed research discovered an unambiguous contribution of higher education to the employment of youth. For the full sample of 20 countries, we discovered the reverse connection of the corresponding variables: the correlation is 10.28%. This means that unemployment among youth grows in the course of the dissemination of higher education. However, for the specified sample of the top 15 countries with the largest connection of university-industry R&D collaboration in 2022, the correlation equals -3.27%.

The qualitative treatment of this result means that the high level of education facilitates the employment of youth only under the condition of the close connection

between the market of higher education services and the labour market. This new important conclusion allowed discovering and substantiating the condition for an increase in the effectiveness of social investments in higher education, which is university-industry R&D collaboration. At that, the organisational issues of this

collaboration remain outside the scope of this research, which is its limitation. Future scientific studies should study in detail the connection between higher education and the labour market and offer recommendations for the organisation and management of university-industry R&D collaboration..

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