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Evaluating Healthcare Accessibility in Kazakhstan: Urban and Rural Perspectives

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ABSTRACT

Despite the policy pursued by the Head of State and the government to improve the current healthcare system and certain successes achieved, the quality and availability of services provided by medical organizations to the Kazakhstan population remain low. This is evidenced by statements by officials, as well as a survey of the population. This article examines the primary trends in healthcare development with a particular focus on the urban-rural divide and proposes strategies to enhance service quality and accessibility in rural areas. Given the complexity of the tasks, both theoretical and empirical research methods were used in the research process, in particular economic and statistical methods and structural and institutional analysis. A special role in the study belongs to a sociological survey, which made it possible to obtain information about the quality and availability of medical services for various groups of the population, depending on their place of residence. Based on a comprehensive study, the main trends in the development of healthcare in the republic in recent years have been identified. It has been determined that in the context of the availability of medical services, the main gap lies along the rural-urban line. Based on the identified problems, recommendations were developed to eliminate them and improve the quality of medical services. Further, the study explores the attitudes towards medical treatment based on the place of residence, leading to targeted proposals to enhance the quality and accessibility of medical care in rural areas.

KEYWORDS: Economy, Socio-Economic Potential, Healthcare, Medical Services, Availability, Quality, Population, Village, City

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1. INTRODUCTION

According to the World Health Organization, health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity (WHO, 2022). As they say, health is not everything, but without health, everything else is worthless. This is because good health is a prerequisite for enjoying life and participating in many of its key components, including education, work, and society. In today's world, with significant gaps in primary health care, trends such as population aging, the growing burden of non-communicable diseases and multimorbidity, as well as the epidemic of chronic diseases, persistent inequalities, and widening gender gaps deserve special attention.

A key component and indicator of the national health system's effectiveness is the population's health in rural areas. According to the World Bank, approximately 43% of the world's population lives in remote rural areas, which often experience inequalities in the provision of health services compared to urban agglomerations (World Bank, 2022). Numerous studies show that rural residents have shorter life expectancies, lead less healthy lifestyles, and generally live in poorer health due to higher rates of chronic diseases. They also face various social and health threats driven by rising poverty and unemployment. Providing quality healthcare services in rural areas is also hampered by the general trend of an increasingly aging population, barriers to accessing health services, and challenges in finding and retaining qualified healthcare personnel locally (OCDE, 2020). Rural areas typically have lower incomes, lower levels of education, slower progress in eliminating unhealthy habits, and reduced investment in health infrastructure due to higher costs.

In Kazakhstan, the nation's health is the subject of official discourse at the highest level. The importance of the problem is evidenced by the increase in funds for the healthcare system (Tokayev, 2023), plans to equip laboratories with high-tech equipment, create a Center for laboratory and technical testing of medical products (Akorda, 2021), and build medical and paramedic-midwife stations within two years in 650 villages, modernize district hospitals, create stroke centers, surgery, intensive care and rehabilitation departments in them, develop telemedicine for residents of remote areas (Akorda, 2022).

A separate difficulty is access to medical care in rural areas, where 38% of the country's population lives. The availability of expensive drugs for rural patients with chronic diseases is two times lower than for urban patients. Rural medicine is experiencing a shortage of personnel: The supply of doctors in rural areas is 17.2 per 10 thousand population (in general in the Republic of Kazakhstan – 40.9). More than 200 rural settlements do not have medical facilities; about 400 medical facilities are in rented, emergency, adapted buildings. The rural primary healthcare infrastructure is more than 50% worn out.

On the other hand, the discourse of problems with the availability of medical care is also present in the speeches of the President of the Republic of Kazakhstan: President K.-J. Tokayev mentions that in addition to infrastructural differences, there is a striking imbalance in the provision of personnel in cities and villages, difficulties remain with access to essential medical services in the regions, talks about the artificiality of dividing medical care into state-guaranteed and insurance packages, mentions underfunding of the industry, notes the poor equipment of maternity hospitals and intensive care units (Akorda, 2024).

This study provides an insightful exploration of the disparities in healthcare provision between urban and rural settings in Kazakhstan, a subject of crucial importance given the significant portion of the nation's population living in rural areas. This gap is exacerbated by socioeconomic factors such as poverty, unemployment, and lower levels of education in rural regions. Unlike previous studies that may have focused on singular aspects of healthcare disparities, this study employs a holistic approach that considers

conomic, social, and infrastructural dimensions concurrently. Considering all the above-mentioned, the purpose of this article is to study the main trends in the development of healthcare, with an emphasis on the urban-rural context, and to develop proposals for improving its quality and accessibility in rural areas. The study concludes that medical and social problems are especially pronounced in rural areas: high morbidity and mortality rates and low levels of quality of life of the population. The supply of medicines to the rural population was 30% lower than that of the urban population. Therefore, issues of organization and quality of medical care for the rural population require further study. First, social programs for young professionals should be developed to make work in rural areas socially attractive.

2. LITERATURE REVIEW

According to the WHO definition, ensuring the quality of health services is the result of several components: the integrity of the health care system, adequacy of the actions of service providers, good governance, qualified and competent labor resources; ensuring timely and adequate financing; creation of information systems that allow for constant monitoring of the quality of medical care; provision of medicines; equipping medical institutions with modern equipment and technologies; equal access to health care (WHO, 2022).

The basic definitions of equality and, accordingly, inequality in providing the population with medical care were formulated in the last decades of the twentieth century. Subsequently, it did not undergo any significant changes. Access to medical care is a multifaceted indicator that is very difficult to measure. Therefore, in developed countries, instead of the concept of "equal access", the idea of "equality of access" is often used to achieve fairness in the distribution of medical services and resources in the health sector (Asante et al., 2006).

O'Donnell et al. (2015) note that health inequality is both a cause and a consequence of income inequality. The level of health affects the ability to earn income (wages), and the level of income determines the ability to improve health by purchasing medical services, proper nutrition, and other benefits determined by lifestyle and affecting health. The income level also affects indirect factors, such as the quality of housing, the level of crime in the area, the level of education and lifestyle, etc., which determine the level of health.

Research on equity in access to health care has primarily focused on comparing the level of access or consumption of health care services to their level of need. Needs are derived from the relationship: the level of health and assistance received. The question of whether the existing relationship between health and care is vertically equitable tends to be left behind the scenes, and researchers study inequalities within socioeconomic groups (Sutton, 2002).

Schmidt et al. (2015) identify several ways in which implementing universal access to health care will impact equity. The subject of the analysis is possible mechanisms for ensuring universal access and its impact on inequality in health care. Gwatkin and Ergo (2011) note that this concept is most often implemented as "trickle down": first, the wealthier members of society receive benefits, and then the least affluent segments of the population.

As an example of foreign empirical research, we can highlight the work of Morris et al. (2005). To analyze healthcare consumption in the National Health Service in England, the authors used a large dataset from 1998 to 2000. They set a goal to determine whether there was inequality in access to health care. The research method chosen was multiple regression analysis using many variables characterizing morbidity, demographic and socio-economic status of individuals, and factors in the supply of medical services. The level of provision of medical care (supply factors at the local level) also influences inequality in access to medical care, depending on place of residence.

A significant part of the empirical literature is devoted to inequality in access to health care in specific countries. In the 1990s–2000s, research was carried out mainly in developed countries. After the UN adopted the Millennium Goals and the Sustainable Development Goals, including universal health coverage, developing countries, including the poorest countries in Africa, became the focus of country studies.

Among comparative cross-country studies of inequality in the receipt of health care, the work of van Doorslaer et al. (2004), which analyzed data from the European Community Household Panel, should be highlighted. Inequality in the variable "probability of visiting a general practitioner" due to differences in income was not identified. However, inequality in consumption was found for the variable "probability of visiting a specialist doctor": the affluent segments of society benefited. Despite their lower need for medical care, more affluent and more educated individuals are more likely to visit a specialist than poorer people.

Among the new directions are studies of access to medical care for older people and the impact of social reforms, particularly pension reform, on access (Hagen, 2018). The area related to racial discrimination and inequality in access to medical care has developed in the United States. Examples of country studies include the work of Trannoy et al. (2010) on France and Rosa Dias (2010) on the UK. Among other researchers on this topic, it is worth mentioning Roemer & Trannoy (2016), Jones et al. (2014), Pasqualini et al. (2017), and Anirban Mitra (2021), who look at this problem from the point of view of the relationship between age and inequality in the provision of health care.

A study by Maeda et al. (2014), based on data from 11 countries with different income levels, identified a mechanism for introducing universal health coverage. The study focused more on public sector workers and urban residents employed in the economy. Clearly, this category of the population has a greater demand and receives more medical services compared to the poor or people living in rural areas.

Modern research is devoted to the results of reforms and assessing the dynamics of inequality. China has significantly reduced inequality (Li et al., 2011; Long et al., 2013; Yu, 2015). Researchers are studying access to medical care not only in China but also in other countries in the region: Vietnam (Nguyen et al., 2012; Palmer, 2014), Thailand (Li et al., 2011), Taiwan (Jui-fen, Tung-Liang, 2018), etc.

In Latin America, many studies have focused on the impact of political systems on health care. For example, Hartman (2016) examines the effect of post-neoliberal policies on reducing inequalities in health care. In addition, studies are conducted on the availability of medical care for certain social groups or classes of diseases.

The problems of improving the organization and management of medical care to the rural population, aimed at increasing its accessibility and timeliness, considering territorial and local differences, are relevant and are solved in the studies of many authors from the post-Soviet space. In particular, we can note empirical studies that made it possible to identify how, in the event of illness, the opportunities to receive medical care differ for citizens differing in gender, age, education, income level, and place of residence (Vyalykh, 2012, 2015; Kochkina, Krasilnikova, Shishkin, 2015; Gavrilov et al., 2016).

In Kazakhstan, we can highlight the research of Utegenova (2014), Baigenzhin et al. (2015), Kalmataeva and Kalieva (2016), and Spankulova et al. (2022). We conducted research focused on improving the quality and availability of pharmaceutical care for the rural population in the Republic of Kazakhstan. The need for a comprehensive solution to rural problems is reflected in ongoing national projects, in which priority is given to protecting public health and improving rural living standards (Adilet, 2022).

In general, it should be noted that the results obtained relate mainly to certain aspects of healthcare and form a somewhat fragmented picture of social differences in the availability

of medical care. In Kazakhstan, the research has pointed out specific issues related to rural healthcare provision, where disparities in access to pharmaceutical services and medical care are significant. Despite national efforts to improve conditions, rural areas still lag behind urban centers in terms of both resources and outcomes. Going forward, it is essential to integrate healthcare policy with broader socio-economic strategies.

3. METHODOLOGY

Considering the complexity of the problems involved, theoretical and empirical research methods were used in the study. These include economic and statistical methods, structural and institutional analysis, and sociological survey methods.

The study's main purpose is to study the characteristics of attitudes towards treatment related to the place of residence and the family's socio-economic status.

As part of this study, we investigated differences in the availability of medical care for the main socio-economic groups of the population living in urban and rural areas. The subject of the analysis is, first of all, the dynamics of differences in the appeal of citizens for different types of medical care when health problems arise. A detailed analysis is then carried out of many factors determining whether access to medical care differs. The reasons for refusing to see doctors, different opportunities to receive free medical care, and various reasons for seeking paid medical services are considered.

The motives for the preferences of consumers of medical services in Kazakhstan were studied using a theoretical model that considers the behavioral characteristics of the perception of medical services. One of these features is the respondent's understanding of the basic level of his health.

In behavioral economics - in particular, in prospect theory (Kahneman & Tversky, 1979) it is shown that people assess their willingness to pay for certain goods depending on this reference point. In addition, biases in these estimates may depend on socio-demographic characteristics, which we also take into account for the sample of residents of Kazakhstan.

During the sociological survey, 1673 people were interviewed, of which 59.3% lived in cities and 50.7% in rural areas. Below is a detailed Table 1 summarizing the demographic and employment sector distribution of the survey respondents based on the information provided.

TABLE 1. List of the interview questions

Category	Description	Percentage	Count. (Approx.)
Geographic Distribution	Urban Residents	59.3%	993
	Rural Residents	50.7%	848
Employment Sector	Healthcare Workers	13.8%	231
	Education, Science, Culture	17.8%	298
	Housing and Communal Services	2.5%	42
	Trade, Public Catering	11.3%	189
	Communications, Transport	6.7%	112
	Communications, Transport	6.7%	112
	Construction	2.5%	42
	Industry	6.4%	107
	Communications, Transport	6.7%	112
	Construction	2.5%	42

	Industry	6.4%	107
	Agriculture	12.7%	213
	Finance, Banks	5.5%	92
	Temporarily Unemployed	1.8%	30
	Student	8%	134
	Pensioner	0.9%	15
	Unemployed	3%	50
	Housewife	4.1%	69
	Other Occupations	3%	50
Age Distribution	18-24 years	10.1%	169
	25-34 years	26.9%	450
	35-44 years	24.2%	405
	45-54 years	22.1%	370
	55-64 years	10.0%	167
	65 years and older	6.7%	112
Gender Distribution	Female	61.8%	1034
	Male	38.2%	639
Total			1673

Note: compiled by authors

The respondents were differentiated by level of education: incomplete secondary, general secondary, specialized secondary, and higher. Respondents were also divided into quintiles according to the income level per household member.

The survey was conducted in September-October 2023. The sample was stratified by key demographics such as location (urban vs. rural), age, gender, and employment sector to ensure that it represents the diversity of the Kazakhstani population. Within each stratum, respondents were randomly selected to minimize sampling bias and enhance the reliability of the survey results. Data was collected through electronic surveys, depending on the accessibility and preference of the respondents. This approach helped to increase the response rate and the accuracy of the data collected.

The data was processed using the SPSS program and involved a series of analytical techniques to ensure rigorous interpretation and meaningful insights. By employing these methods, the study aims to provide a robust analysis of the factors influencing healthcare access and to suggest targeted interventions for improving healthcare equity in Kazakhstan.

4. FINDINGS AND DISCUSSION

As a result of the policy pursued by the Head of State and the government, radical and effective measures are being taken in the republic to improve the current healthcare system. Some progress has already been achieved. Over the past three years, the volume of healthcare financing in Kazakhstan has increased from 1.1 trillion to 2.8 trillion tenge, which has made it possible to significantly increase the volume of medical services provided to the population. Overall, the share of healthcare spending in total GDP increased from 2.8% in 2019 to 3.7% in 2022. On the contrary, the share of out-of-pocket expenses of the population for medical services decreased from 34% in 2018 to 31% in 2022. Life expectancy in 2023 was 74.4 years, an increase of 6.8 years compared to 1991, while for men, the figure increased by 7.7 years and for women by six years (Minzdrav of RK, 2023).

However, despite this, the quality and availability of services provided by medical organizations to the population of Kazakhstan still need to improve. This is evidenced by statements by officials, as well as a survey of the population. In 2022, more than three million people remained outside the health

insurance system. The problem is the need for more healthcare organizations in 850 villages of Kazakhstan, and the shortage of health workers in rural areas of 2000 staff positions. The doctor spends time and resources searching for the disease code and finding out the source of funding (guaranteed mandatory medical care (GMMC) or compulsory medical insurance (CMI)) for the necessary services. At the same time, the doctor must consider the monthly financing plan from two sources (GMMC and CMI), which must be fulfilled. This complex division of funding creates confusion and mistakes. Experts call another problem the creation of a digital healthcare environment by people who do not know much about the work of doctors.

The main divide runs along the rural-urban line in the context of access to medical services. Today, there are 6,256 rural settlements in the republic, home to 7.6 million people, which is 38.4% of the country's total population. At the same time, the share of the rural population with incomes below the subsistence level is 7.2%, and the unemployment rate is 4.7%. The share of self-employed people was 33% or 1.2 million people. Migration flows serve as a response of the rural population to geographical inequality of living and working conditions. The main population influx in 2020 occurred in the cities of Almaty, Astana, and Shymkent. From the perspective of migrants, these cities are regions with more favorable living and employment conditions. The attractiveness factors of megacities are more developed areas of employment compared to other regions, the development of infrastructure facilities, higher levels of wages and quality of life, the concentration of training institutions, and other facilities (Gaisina et al., 2023).

As a result of the work carried out following the requirements of the Law of the Republic of Kazakhstan "On the administrative-territorial structure of the Republic of Kazakhstan" over the past ten years, the number of rural settlements has decreased from 6,838 to 6,256, or by 582 units. There was a reduction in villages with a population of less than 50 people, with the population tied to nearby settlements. Monitoring and analysis of village security is carried out annually following the System of Regional Standards requirements. Thus, in 2023, the level of protection was 64.3%, which is 2.1 points more than in 2022. At the same time, the highest provision of medical facilities and services is observed in the Mangistau region - 72.4%, Atyrau region - 70% and Aktobe region - 69.6%. The low level of security in the East Kazakhstan region is 58%, Ulytau - 57% and Abay - 55.4%.

At the same time, according to the results of an analysis of indicators of regional standards, there is an increase in the number of villages with high and average levels of wealth. Thus, the number of villages with a high level of security is 1,296 units, 169 units more than in 2022. At the same time, the share of villages with a low-income level decreased from 1,676 to 1,399 villages. To improve the quality of life of the rural population and increase the level of provision with regional standards, the Concept for the Development of Rural Territories of the Republic of Kazakhstan for 2023–2027 is being implemented.

The concept is aimed at unlocking the socio-economic potential of rural areas, considering their geographical features and competitive advantages. It defines the main directions for reducing imbalances in the provision of essential services, increasing the income level of the rural population, developing border areas, and systematizing a set of measures aimed at developing villages.

To expand access to medical care for village residents, the work of 149 mobile medical complexes and two medical trains "Zhardem" and "Salamatty Kazakhstan", 33 aircraft were organized. The project "Modernization of Rural Healthcare" was developed (Prime Minister, 2022).

At the same time, it is essential to note the existing problems, in particular, the complexity of the rules for the functioning of health insurance systems: according to the ministry, the presence of two insurance contracts for the Statewide Compulsory Medical Insurance/Compulsory Medical Insurance

leads to the involvement of health workers in the process of administering the packages, and distracts them from their main activities, leading to a decrease in quality provision of medical services. According to the monitoring data of the Medical and Pharmaceutical Control Committee, six regions were named unfavorable in terms of health care according to the criterion of justified complaints: Pavlodar, Almaty, Mangistau, Jambyl, Kyzylorda regions and Almaty-city (Minzdrav of RK, 2022).

An analysis of staffing in rural areas shows a shortage of more than 1,700 medical workers, including more than 1,000 doctors (734 nurses). The following situation has developed in the countryside: more than 200 settlements do not have medical facilities, and about 400 villages are in rented, emergency, adapted buildings. The deterioration of the medical infrastructure of primary health care in rural areas exceeds 50%.

Previously, these medical organizations not only assisted villagers but also ensured the supply of necessary medical supplies. But at present, many small and remote settlements do not have a single pharmacy, and the problem of providing rural residents with medicines remains one of the most acute.

As a result of the ongoing “optimization”, residents of rural areas have much fewer opportunities to receive quality medical care than residents of cities, not to mention high-tech care, for which rural residents have to turn to large urban medical institutions, often in conditions of incredible territorial inaccessibility. This can largely be explained by the underdevelopment of the road and transport infrastructure - people simply do not have the opportunity to get to the first aid station.

The survey results show that 45.8% of rural residents travel to cities for medical care, highlighting the increasing relevance of access issues in these areas. According to the same survey, when asked, "How do you assess the state of your health?" 35.4% rated it as satisfactory, 20.9% as good, and 20.3% reported chronic diseases. Additionally, only 19.5% visit a doctor when feeling unwell, 41.8% do so when their health deteriorates, and 31.7% seek medical attention only in cases of severe illness (Figure 1).

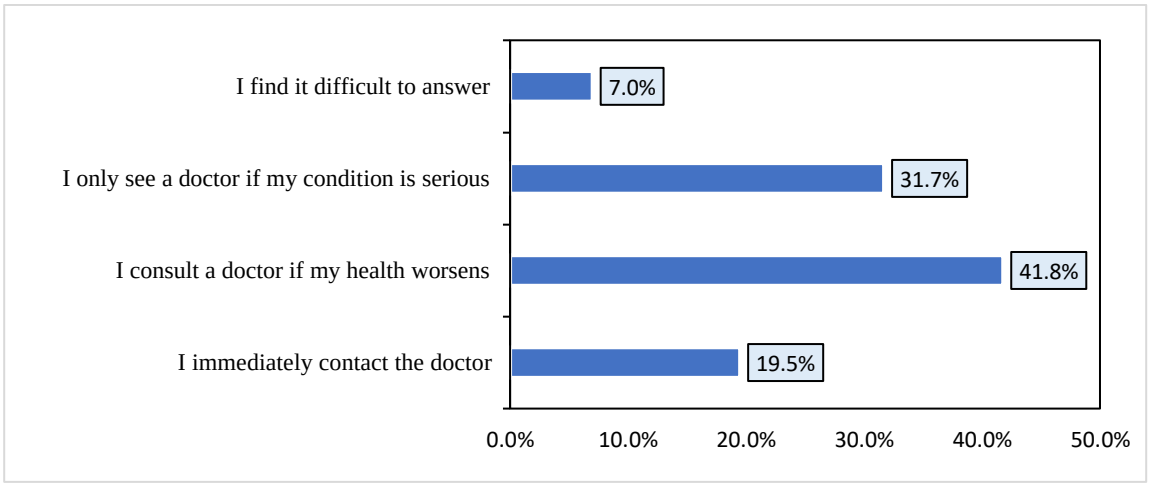

FIGURE 1. Distribution of survey participants according to specialties, in % Answers to the question “If you feel unwell, then...”

Note: compiled by authors

Due to frequent lack of access to medical care, a significant 68.5% of rural residents resorted to self-medication. This rate of self-treatment is notably higher among rural residents compared to their urban counterparts, underscoring the urgent need for increased

availability of doctors, ambulances, and medicines in village areas. Financially, 45.5% of individuals paid for their treatment out-of-pocket, while only 14% received treatment funded by public resources. Additionally, 16.8% of treatments were financed through the Compulsory Health Insurance Fund, and 11% of individuals received assistance from relatives (refer to Figure 2).

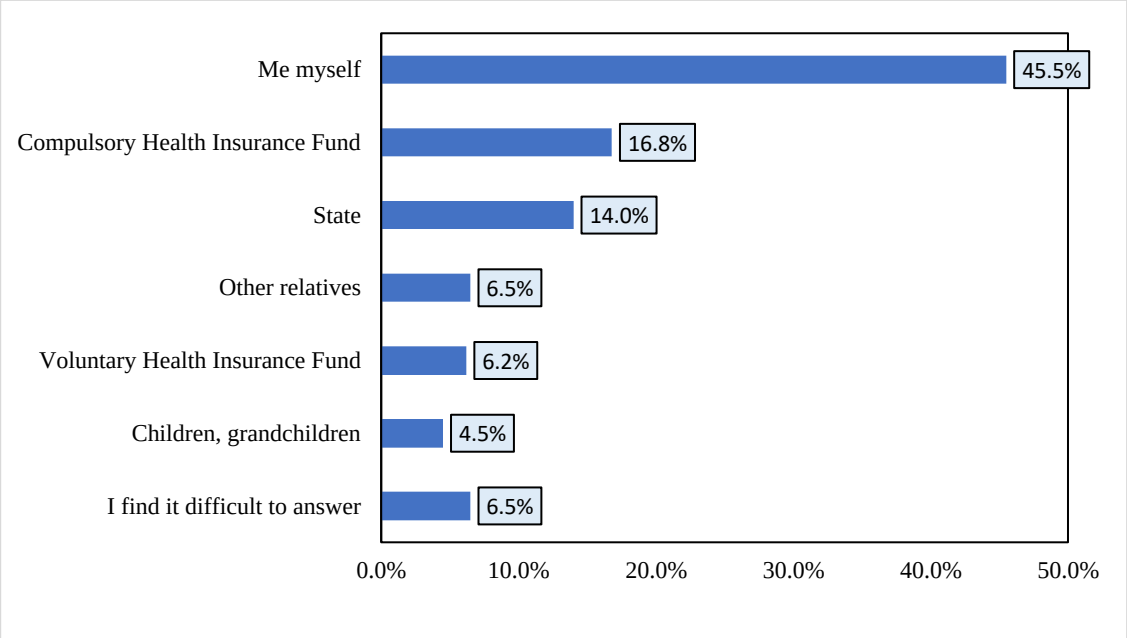

FIGURE 2. Answers to the question "I believe that if I or my family members need treatment, the cost will be covered by…."

Note: compiled by authors

The data collected reveals a significant reliance on self-funding for medical expenses among rural residents in Kazakhstan, especially as it pertains to inpatient treatments where individuals often pay out-of-pocket for necessary medications, syringes, and bandages. Monthly purchases of these medical supplies are made by 42.2% of rural residents, with the demand escalating sharply with age. Specifically, while only 15.1% of the population aged 14-29 years report such expenditures, this figure jumps dramatically to 68.3% for those aged 60 and older. Concerning the financial strategies adopted for covering high-cost treatments not subsidized by state or insurance funds, the strategies varied significantly among the respondents: a substantial 48.3% of individuals managed these expenses themselves. About 22.5% borrowed money from relatives to cover costs. Another 20.2% resorted to taking out bank loans. The remaining 8% turned to alternative treatments, such as folk remedies. These findings highlight the financial burdens and coping mechanisms associated with healthcare in rural Kazakhstan, illustrating a heavy dependency on personal and familial resources, as well as institutional loans, to manage health-related expenditures (see Figure 3).

The analysis reveals significant challenges in healthcare access and quality experienced by rural residents. The primary issues identified include:

(1) Extended Waiting Times: Approximately 41.2% of rural residents report long waiting times to see the appropriate specialists. This delay in accessing care underscores inefficiencies within the rural healthcare delivery system.

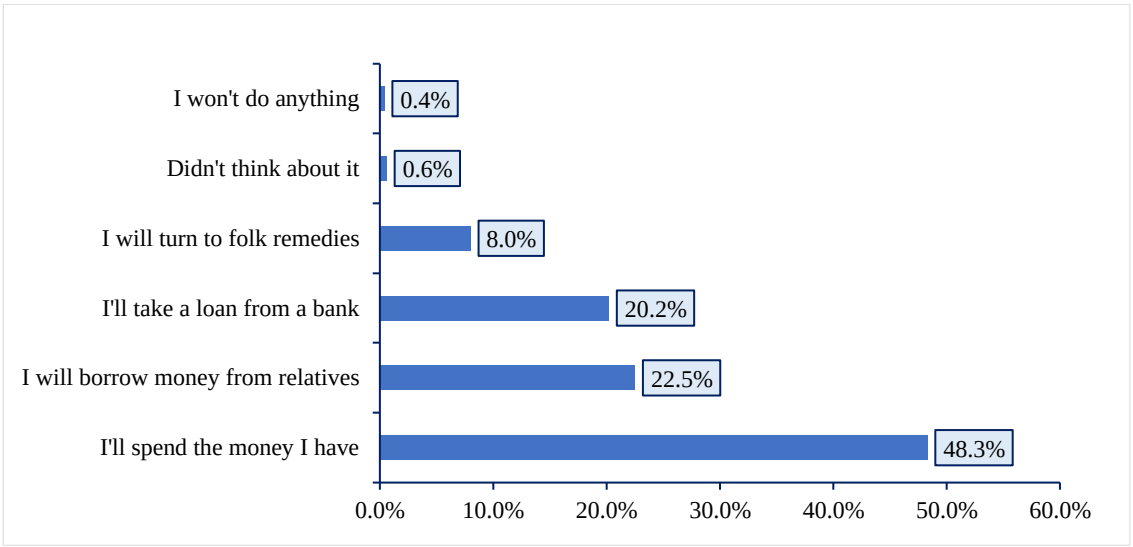

FIGURE 3. Answers to the question, "If I need expensive treatment that is not paid for by the state and insurance funds, then…"

Note: compiled by authors

(2) Low Doctor Qualification: Concerns over the qualifications of doctors are significant, with 33% of respondents doubting the competency of medical professionals available to them. This perception not only reflects on the training and skills of the healthcare workforce but also impacts patient trust and satisfaction levels.

(3) Inadequate Medical Equipment: A further 35% of the participants highlighted poor equipment provision at medical facilities. The scarcity of modern diagnostic and treatment tools in rural areas hampers the ability of healthcare providers to offer comprehensive and advanced medical care.

These factors contribute to nearly half of the rural population seeking medical assistance from regional centers. Despite 84.7% of rural residents having access to local clinics or health centers, the inadequacy in the quality of care compels 43.9% to travel to urban centers for healthcare services. This situation indicates a mismatch between the availability of healthcare infrastructure and the quality of services provided.

Moreover, the deficiency in healthcare services is influencing migration sentiments among the rural populace, with 20.8% citing "problems with medical care" as a primary motive for relocating to urban areas. It is noteworthy that a significant proportion of rural residents, 40.2%, refrained from seeking medical help in 2023—a rate higher than the national average of 29.5%.

The reluctance to seek medical help among rural residents is primarily driven by skepticism toward the effectiveness of the treatment available and dissatisfaction with the operations of medical organizations. These insights reveal a critical need for improvements in healthcare service delivery, particularly in enhancing the capabilities of healthcare professionals and infrastructure in rural areas to ensure equitable access to quality medical care across the country.

Modern rural settlements of our country experience a shortage of medical personnel, including specialized specialists, an insufficient supply of medicines, and the need to update the material and technical base of healthcare.

The main reasons rural residents do not seek medical help include: I do not expect effective treatment and am not satisfied with the work of the medical organization (see Table 2).

TABLE 2. Reasons why persons aged 15 and over do not seek medical help if they need medical care

Respondents	Total	Including those living:		
		Urban	with a population of 1 mln. ppl. or more	Rural
Did not apply to medical organizations if there was a need for medical care				
Age 15 +	20,9	21,5	15,9	20,4
Reasons for not applying				
Do not expect effective treatment	29,2	35,4	35,2	18,2
There was no time	22,3	23,1	27,2	20.0
Necessary treatment can only be obtained on a paid basis	12,0	12,0	11,2	12,0
It was challenging to get to the medical facility	5,1	3,8	4,0	9,0
Cannot get to a medical facility without assistance	4,9	4,1	3,2	7,3
Did not have information about where to get the necessary medical care	1,2	1,3	1,8	1,5
Other reasons	6,7	6,5	6,7	7,8

Note: compiled by authors

Even though more than 9,000 facilities in Kazakhstan provide pharmaceutical services to the population, about 4,000 rural settlements do not have pharmacies, and only 64% of them organize the sale of medicines through healthcare institutions. Providing the rural population with medicines on market principles has led to limited availability of the rural population for the following reasons: remoteness of the territory, difficulties with delivery, and insolvency of the population (Turgambayeva et al., 2021).

In Kazakhstan, the government has approved a list of medicines that are provided free of charge as part of the guaranteed volume of free medical care. Even though the procurement of medicines is carried out mainly through tenders, the Kazakh system involves the establishment of a price ceiling. Thus, the health of rural residents depends on many factors. However, we can confidently say that a significant role in preserving and restoring the health of rural residents still belongs to healthcare institutions and the organization of medical care in rural areas. “Seeking medical care” is influenced not only by health status and the need and desire for preventive examinations but also by the availability of various types of medical care.

When determining the factors that negatively affect the availability and quality of medical care in modern Kazakhstan, the relative unanimity of experts regarding the importance of financing the sector was recorded. Lack of financial resources or their untimely provision is assessed as a critical obstacle to the development of medical institutions.

According to experts, another factor that has negative consequences is the low penetration of digital technologies into medical practices. In this context, experts supported the idea that the digitalization of routine medical practices and the development of telemedicine will, over time, significantly bridge the gap in access to quality medical services. At the same time, the problem with integrating digital technologies into the public health care system is more than just medical. In this case, experts note that we are discussing a problematic taxon. Thus, the solution to the problem depends on providing access to broadband high-speed Internet throughout the country, the availability of highly qualified medical personnel capable of working in digital medicine, and the provision of medical institutions with the necessary equipment. According to the experts interviewed, it is evident that the digitalization

of medical services will also require significant investments in medical sciences and the development of related industries.

5. CONCLUSIONS

An analysis of the availability of medical services in rural areas shows that its level depends on many factors. The most significant component of this problem is the medical institutions' network and staffing. Unfortunately, the downsizing trend of hospitals and outpatient clinics in rural areas is not abating. Of course, this contributes to the aggravation of the already difficult situation of rural residents. Increasing accessibility and improving the quality of medical services are the most critical factors influencing the life expectancy of the rural population (as well as the urban population). In addition, they are a primary condition for ensuring the principle of social equality in the realization of the right of every citizen to life and health care.

According to subjective estimates of the population, according to the survey, the most significant differences are in place of residence. The least acute differences are age and gender. The survey data indicate an established stable interaction model with the healthcare sector, which is reproduced almost unchanged in all socio-demographic strata. The general attitude is more focused on self-treatment. However, it is predominant in rural areas.

In general, the analysis shows that, on the one hand, during outpatient treatment, the most remarkable socio-demographic differences are observed in the behavior of different groups of patients when choosing paid medical services. On the other hand, differences between citizens in income level, education, age, and place of residence only slightly increase or decrease the likelihood of using paid services. In addition, the unconditional right of all members of society to free (that is, at the expense of the state) medical care is firmly rooted in the population's minds.

If there is insufficient access to medical care from public health institutions, people with low incomes may be less likely to receive medical services than their more affluent fellow citizens. Moreover, every sixth Kazakhstani citizen is not covered by compulsory medical insurance. The studied discourses also document discrimination concerning the rights of such vulnerable groups as people with chronic diseases and people with disabilities.

To reduce the shortage of medical personnel in rural healthcare, local executive bodies will provide social support to young specialists (providing lifting allowances, housing, and payment for utilities), the state order will increase the training of specialists in in-demand medical specialties at the regional level within the framework of target and local budgets, including the training of advanced medical personnel in the most in-demand specialties.

Ways to solve the identified problems at the present stage of development should be:

(1) To improve the quality of diagnostics in rural healthcare and ensure accessibility of laboratory tests, medical laboratories of district and interdistrict hospitals must be equipped with modern analyzers to perform basic laboratory tests.

(2) The population of remote and hard-to-reach rural areas should be provided with high-quality medical services through medical aviation services, and measures should be taken to ensure the safety of patients, personnel of mobile medical teams, and flight personnel.

(3) For the timely provision of medical care to the population, dynamic monitoring of patients with chronic diseases, and the introduction of best practices by local executive bodies, it is essential to resolve the issues of providing primary care doctors with sanitary vehicles.

The analysis of medical service availability in rural areas highlights a critical socio-economic issue influenced by the network and staffing of medical institutions. The trend of downsizing rural medical facilities exacerbates the challenge of providing adequate health care, directly impacting life expectancy and social equality. To address these issues, the proposed solutions include enhancing diagnostic quality through modern equipment, extending high-quality medical services, and

improving patient monitoring and care practices with better resources for primary care providers. These measures aim to mitigate the effects of healthcare shortages and ensure equitable access to medical services across all demographic segments. Further research is needed to understand the cultural dynamics that influence health behaviors in rural areas, particularly the preference for self-treatment. Studies should focus on developing culturally appropriate educational programs that promote awareness and understanding of available medical services.

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Comparative Analysis of Socio-Cultural Environment Development of Kazakhstan's Regions

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ABSTRACT

This study conducts a comparative analysis of the socio-cultural environments across the regions of Kazakhstan, focusing on indicators of cultural infrastructure. The authors focus on considering the indicators of the cultural infrastructure of the regions. Utilizing data from the Bureau of National Statistics of the Republic of Kazakhstan, this research explores the dynamics and structural characteristics of these indicators from 1995 to 2022. The authors proposed using the multidimensional comparative analysis method to obtain a comprehensive rating assessment of the sociocultural environment of the regions. The central place in the study is the determination of regional ratings, reflecting the relative position of each region based on the development of its socio-cultural environment. These rankings offer valuable information to policymakers, stakeholders, and researchers alike, enabling informed decisions and targeted interventions to promote balanced socio-cultural progress across Kazakhstan. This study contributes to the understanding of the socio-cultural development of Kazakhstan by providing a detailed analysis of regional differences and the dynamics of changes in their leading indicators. The author's approach to assessing the development of the socio-cultural environment of the regions of Kazakhstan proposed in the article can be considered by researchers in this field as a convenient and reliable analysis tool. The results of the study emphasize the importance of a multidimensional approach to assessing and solving socio-cultural problems and open up opportunities for an inclusive approach in developing a strategy for the development of the socio-cultural environment of the regions of Kazakhstan.

KEYWORDS: Social Potential, Cultural Environment, Economic Growth, Region, Regional Differences, Kazakhstan

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1. INTRODUCTION

In the diverse mosaic of Kazakhstan's socio-cultural landscape, each region weaves a unique thread contributing to the nation's rich tapestry of heritage, traditions, and development. As the country strides forward in the 21st century, understanding the intricate dynamics of socio-cultural evolution across its regions becomes imperative for policymakers, scholars, and stakeholders. The socio-cultural development of Kazakhstan's regions reflects historical legacies and mirrors contemporary challenges and aspirations. Kazakhstan stands at a pivotal juncture in its history, marked by rapid economic growth, urbanization, and socio-cultural transformations. In this dynamic landscape, the socio-cultural fabric of its regions emerges as a crucial arena for investigation. Understanding the nuances of the socio-cultural development of Kazakhstan's regions can provide deep insight into the driving forces of regional development, differences, and the potential for harmonious growth. Moreover, the scientific interest in exploring Kazakhstan's socio-cultural environment extends beyond academic curiosity. This is consistent with broader sustainable development and social and cultural policy agendas.

A particular region's socio-cultural environment is shaped by various factors including the local traditions, customs, and social norms passed down through generations (Bekbossinova et al., 2023). These elements influence how people interact, their attitudes towards work, family dynamics, and overall lifestyle choices. Additionally, the socio-cultural environment is also impacted by the region's history, language, religion, and the arts, all of which contribute to shaping a unique identity for the community (Belikova et al., 2021). This amalgamation of influences plays a crucial role in defining the values and behaviors of the inhabitants, ultimately creating a distinct socio-cultural landscape for the region.

Kazakhstan's vast expanse encompasses a kaleidoscope of regions, each characterized by its distinct history, geography, and socio-cultural heritage. Disparities in economic prosperity, infrastructure, educational resources, and cultural preservation efforts underscore the need for a nuanced understanding of regional development. While some regions thrive as economic hubs, attracting investments and fostering innovation, others grapple with socio-economic challenges, striving for sustainable development and equitable opportunities. Exploring these variations sheds light on the underlying factors shaping regional trajectories and informs strategies for balanced regional development.

The need for a comparative analysis becomes evident amid the complexity of Kazakhstan's regional dynamics. By juxtaposing different regions' socio-cultural indicators and development trajectories, researchers can discern patterns, identify best practices, and pinpoint areas requiring targeted interventions. Furthermore, a comparative approach fosters cross-regional dialogue and knowledge exchange, fostering solidarity and mutual learning among diverse communities. By recognizing and celebrating each region's unique strengths while addressing shared challenges collectively, Kazakhstan can harness the full potential of its socio-cultural diversity as a catalyst for sustainable development and societal resilience.

This article aims to conduct a comprehensive and multidimensional comparative analysis of the socio-cultural development across various regions of Kazakhstan. By employing a range of indicators and metrics, the article aims to provide insights into the diverse socio-cultural landscapes within the country, shedding light on the factors influencing development and progress across different regions. A key focus will be establishing a rating estimation system to assess and compare the relative socio-cultural advancements of each region, facilitating a deeper understanding of the disparities and potentials for growth within Kazakhstan's diverse societal fabric. Through this analysis, policymakers, researchers, and

stakeholders can gain valuable insights to inform strategic decision-making, resource allocation, and targeted interventions to foster inclusive and sustainable socio-cultural development across the nation.

2. LITERATURE REVIEW

"Sociocultural environment" is a crucial concept of modern society, defining its cultural and spiritual components. The dynamic development of the sociocultural environment is an essential condition for a person's correct socialization and harmonious spiritual development.

The socio-cultural environment of a region is shaped by a myriad of factors, including its social issues, cultural resources, and prevailing values. These elements collectively influence the developmental trajectory of the region, as outlined in the works of several scholars. For instance, Belikova et al. (2021) and Bekbossinova et al. (2023) have highlighted the comprehensive role of the socio-cultural environment in fostering regional development. Similarly, Polyudova and Olesina (2019) point to its critical role in crafting the identity and cohesion of territorial communities. Morozova et al. (2022) further illustrate the broad impact of the socio-cultural environment on various development strategies that affect health, education, leisure, and overall quality of life. According to Vinnikova (2019), the socio-cultural landscape of a region encompasses a rich tapestry of historical, social, and cultural components that collectively shape human communities. This includes the interaction among individuals, society, and cultural norms. Gregori (2012) delves deeper into the dynamics within this environment, describing it as an interplay of events, symbols, artifacts, and individuals that significantly influence cultural production and the formation of institutions. These studies underscore the profound and multifaceted impact of the socio-cultural environment on regional development and community identity.

The socio-cultural environment of a region encapsulates a unique amalgamation of culture, self-awareness, and values that collectively shape the social dynamics and identity of a specific territorial area. Khrapova (2020) posits that this environment is forged by a confluence of local traditions, customs, and social norms inherited across generations. These cultural elements are pivotal in influencing interpersonal interactions, attitudes towards work, family dynamics, and the broader lifestyle choices prevalent within the community. Further, the socio-cultural landscape of a region is deeply influenced by its historical, linguistic, religious, and artistic legacies. These factors not only contribute to a community's distinct identity but also continuously interact to mold the values and behaviors of its members. Necenko and Grenaderova (2022) enhance this view by emphasizing the importance of regional culture, which includes elements such as dialect, rhetoric, literature, and shared historical narratives, in shaping the socio-cultural milieu. They argue that these cultural artifacts play a crucial role in defining and perpetuating the socio-cultural norms of a region. Additionally, Belikova et al. (2021) discuss the dynamic interplay between tradition and modernity within regional socio-cultural environments. They highlight how communities navigate the challenge of preserving cultural heritage while adapting to modern influences, a process that is crucial in the contemporary redefinition of regional identities. Both external pressures, such as global economic conditions, and internal challenges, including local threats and problems further influence the socio-economic development of a region. These multifarious factors collectively contribute to the shaping of a region's socio-cultural environment, ultimately influencing its path of social and economic development.

In turn, the socio-cultural environment significantly impacts other important aspects of society. According to Proskurina (2022), culture is also identified as a critical resource for increasing labor productivity and the efficiency of state institutions, with socio-cultural factors influencing economic

development. The urban environment, as a socio-cultural space, is shaped by various factors, including philosophy, religion, science, aesthetics, and socio-economic relations, and in turn, influences the well-being, worldview, and culture of its citizens (Shabatura et al., 2018). Toader (2022) discusses the impact of socio-cultural factors on business performance, including social factors like education and government spending and cultural factors like corruption and innovation. Evmenov et al. (2019) consider the relationship between the socio-cultural environment and the economic and innovative development of the region to be significant. Their research examines the innovative development of the socio-cultural sphere of the region, including factors influencing innovation and gaps in development. Puscasu (2010) analysis highlights the importance of social and cultural factors in entrepreneurship, as the evolution of entrepreneurial activity varies from country to country based on culture, values, and norms. Akhter and Sumi (2014) also believe that sociocultural factors play a significant role in the region's economic development and entrepreneurial activity. Kruzmetra et al. (2015) analyze the cultural environment as a potential for the renewal of society and reveal the development of the cultural environment, which can give rise to new social and economic structures and serve as conductors of smart development of territories.

A literature review on the socio-cultural environment of regions reveals the dynamic interplay between tradition and modernity and the balancing act between historical heritage and contemporary influences. Kotradyová and Ontkóc (2022) emphasize the significance of regional identity and its modern manifestations as crucial to social sustainability. Conversely, Nabela et al. (2022) highlight a prevailing trend where local cultures are overshadowed by globalization, advocating for the preservation of cultural identities.

Various methodologies have been adopted to analyze the socio-cultural landscapes of regions. For instance, Bekbossinova (2023) employed a SWOT analysis to delineate the strengths and weaknesses of Kazakhstan's socio-cultural framework. Andriyanova (2021) examined the interplay between regional and urban territories, applying an integral approach to scrutinize management practices. Espartaco (2014) utilized qualitative research to evaluate environmental issues linked to socio-cultural practices in a rural setting. Meanwhile, Vinnikova (2019) investigated the sociocultural and sociological approaches to understanding the interactions among individuals, society, and cultural elements.

In summary, the term "socio-cultural environment" refers to the composite of social, cultural, economic, and political elements that shape our experiences, perceptions, and behaviors. The socio-cultural environment influences public participation, creativity, inclusivity, and societal renewal. Analyzing long-term changes in key indicators of a region's socio-cultural environment is essential for assessing the integration of new trends and for the sustainable development of the region.

The review also points out a gap in the development of a universal approach for comparative analysis and assessment of the socio-cultural development levels across regions. This underscores the need for a more refined methodological framework to effectively evaluate and compare socio-cultural environments.

3. RESEARCH METHODS

In this investigation, evaluating the socio-cultural milieu within Kazakhstan's regions entailed a comprehensive analysis by the authors, consolidating diverse methodologies. The focal point of this analysis involved the meticulous scrutiny of secondary data concerning the abundance and distribution of socio-cultural entities across Kazakhstan's regions. To rigorously analyze the socio-cultural dynamics within Kazakhstan's regions from 1995 to 2022, this study employed a methodology centered around the evaluation of absolute growth for each socio-cultural entity. This method involves a detailed time series analysis, allowing the authors to capture the

growth trends of various facilities across different periods.

Absolute growth is quantified as the difference between the count of each entity in the current year and the count in the base year (1995). The formula used is (1):

$$\Delta Y = Y_i - Y_0 \qquad (1)$$

Y_i – level of the current period indicator

Y_0 - level of the base period indicator

The absolute growth values are then analyzed to identify trends, patterns, and outliers. Statistical tools such as time-series analysis are employed to assess the trajectory of growth across the years, helping to understand whether growth is steady or declining.

Table 1 presents the main components of the socio-cultural environment based on a summary of the literature.

TABLE 1. Components of the socio-cultural environment

No.	Component	Characteristic
1	Social institutions	These are established social structures and organizations that regulate the behavior and interactions of people. Social institutions include families, schools, government, religious organizations, health care, and economic institutions. These institutions define norms, values, and expectations influencing people's behavior.
2	Culture	Culture is a set of shared values, beliefs, norms, customs, traditions, and symbols passed on from generation to generation. It includes language, art, music, literature, religion, and other aspects that reflect the ways of life and identity of a particular group of people or society.
3	Social classes and groups	People in a socio-cultural environment are organized into various social classes, strata, and groups, following their status, wealth, profession, ethnicity, and other factors. These classes and groups may have values, norms, and customs that influence their behavior and interactions.
4	Social connections and networks	In a socio-cultural environment, people interact with each other through various social connections and networks. This may include family, friends, colleagues, neighbors, communities, and other groups we interact with. These connections and networks are essential in transmitting information, support, social support, and forming our social connections.
5	Infrastructure and physical environment	This includes the physical infrastructure and environment, such as cities, homes, roads, parks, workplaces, public spaces, and other elements influencing our lives and interactions. The physical environment can influence our behavior, communication, and availability of resources.

Note: compiled by authors

Absolute growth (chain method), which characterizes the difference between the value of the current and previous periods (2):

$$\Delta Y' = Y_i - Y_{i-1} \qquad (2)$$

where:

Y_i – level of the current period indicator;

Y_{i-1} – level of the indicator of the previous period.

Growth rate (primary method), characterizing the ratio of a given level to the basic one (3):

$$t = \frac{Y_i}{Y_0} \qquad (3)$$

Growth rate (chain method), characterizing the ratio of this level to the previous one (4):

$$t' = \frac{Y_i}{Y_{i-1}} \qquad (4)$$

Gain rate (primary method) - a value showing how many percent the current level is more or less than the base one (5):

$$r = \frac{Y_i}{Y_0} \times 100 - 100 \qquad (5)$$

Gain rate (chain method) - a value showing by what percentage a given level is more or less than the previous one (6):

$$r' = \frac{Y_i}{Y_{i-1}} \times 100 - 100 \quad (6)$$

In addition, an analysis of the existing cultural objects was carried out in the context of the regions of Kazakhstan. That is, the specific weight of the region for each indicator was determined.

The multidimensional comparative analysis method for the rating assessment of regions, which allows us to conduct a comparative analysis of several objects according to several criteria and obtain a comprehensive assessment of the characteristics being studied. A review of available research on this issue showed that there is no single approach to a comprehensive analysis of the socio-cultural environment of the regions.

Stage 1. The system of indicators by which the region's economic potential will be assessed is substantiated, data on these indicators is collected, and a matrix of initial data is formed.

Below is a table that outlines the designated indicators used to assess the region's potential through its socio-cultural infrastructure (Table 2).

TABLE 2. Variables used in the study

No.	Variable	Description
1	THR	Number of theaters
2	MZM	Number of museums
3	CRI	Number of cultural and leisure institutions
4	CNM	Number of cinemas
5	LBR	Number of libraries
6	CNT	Number of concert organizations
7	PRK	Number of parks
8	ZPK	Number of zoological parks (zoos)
9	CRS	Number of circuses

Note: compiled by authors

Stage 2. The date in Table 2 determines the maximum element in each column, which is taken as one. Then, all elements of this graph (a_{ij}) are divided by the maximum element of the reference region (max a_{ij}). As a result, a matrix of standardized coefficients (x_{ij}) is created, presented in formula (7):

$$x_{ij} = \frac{a_{ij}}{max a_{ij}} \qquad (7)$$

If the minimum value of the indicator is the best, then the calculation scale should be changed so that the lowest result corresponds to the highest value of the coefficient.

Stage 3. All elements of the coordinate matrix are squared. With a differentiated approach to the contribution of each indicator to a comprehensive assessment, the resulting squares are multiplied by the value of the corresponding weighting coefficients, usually determined by experts. As a result, the results are summarized by row (8):

$$R_i = K_1 x_{1j}^2 + K_2 x_{2j}^2 + \cdots + K_n x_{nj}^2 \quad (8)$$

Stage 4. After receiving rating scores (Rj), they are ordered by rank, determining the place of each region in the context of the socio-cultural environment's development level. The region with the highest total score is ranked first, followed by the region with the closest total, and so on.

Some of the advantages of the proposed method of multidimensional comparative analysis are as follows: Firstly, the proposed methodology is based on an integrated

multidimensional approach to assessing a region's economic potential, making it possible to take into account its complexity. Secondly, it takes into account the actual achievements of all regions and the degree of their similarity with the indicators of the reference region. Thirdly, the proposed method makes it possible to quantitatively measure the level of development of the socio-cultural environment of the region based on the results of past and current development, which helps to analyze the dynamics of change in the characteristics being studied.

4. FINDINGS AND DISCUSSION

Analysis of the development of the socio-cultural environment of the regions of Kazakhstan from 1995 to 2022. During the analyzed period from 1995 to 2022, the number of theaters in the country as a whole increased by 65.9% (from 44 in 1995 to 73 in 2022), theater attendance increased by two times (k) (from 1321.1 thousand to 2695.6 thousand), the number of events held by theaters increased by 2.28 times (from 6760 to 15396), the number of new productions in theaters increased by 95.6% (k') (from 204 to 399).

In the context of Kazakhstan's regions and the quantity of theater events hosted, Almaty leads with 26% of all events in 2022, trailed by Astana at 13%, the Karaganda region at 11%, and Shymkent at 7%.

Based on data from the Bureau of National Statistics of the Republic of Kazakhstan, the authors analyzed the dynamics of changes in the main indicators of the country's cultural infrastructure over the period under study. The dynamics of attendance and events held by cultural institutions show that a sharp decline was observed in 2020 due to restrictive measures during the pandemic when most cultural institutions were closed (Figure 1).

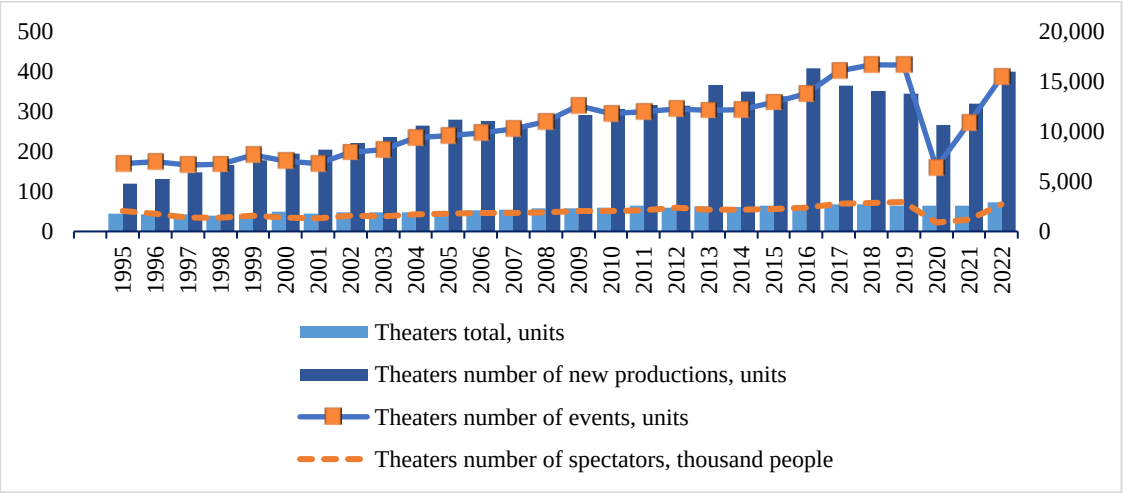

FIGURE 1. Dynamics of performance indicators of theaters in the Republic of Kazakhstan from 1995 to 2022

Note: compiled by authors

During the analyzed period from 1995 to 2022, the number of libraries in the country decreased by 46.7% (from 7352 in 1995 to 3917 in 2022), while the library collection increased by 12.5% (from 99,237 thousand units to 111,607 thousand units), of which in the state language increased by 106.2% (from 14504 thousand units to 29913 thousand units), the number of users increased by 6.6% (from 5795 thousand people to 6178.4 thousand people), of which child users increased by 22% (from 1350.7 thousand people to 1648.8 thousand people), the number of library visits increased by 69.9% compared to 2001.

Thus, the visual representation captures trends, developments, and significant changes in library metrics over the designated period, as described in Figure 2.

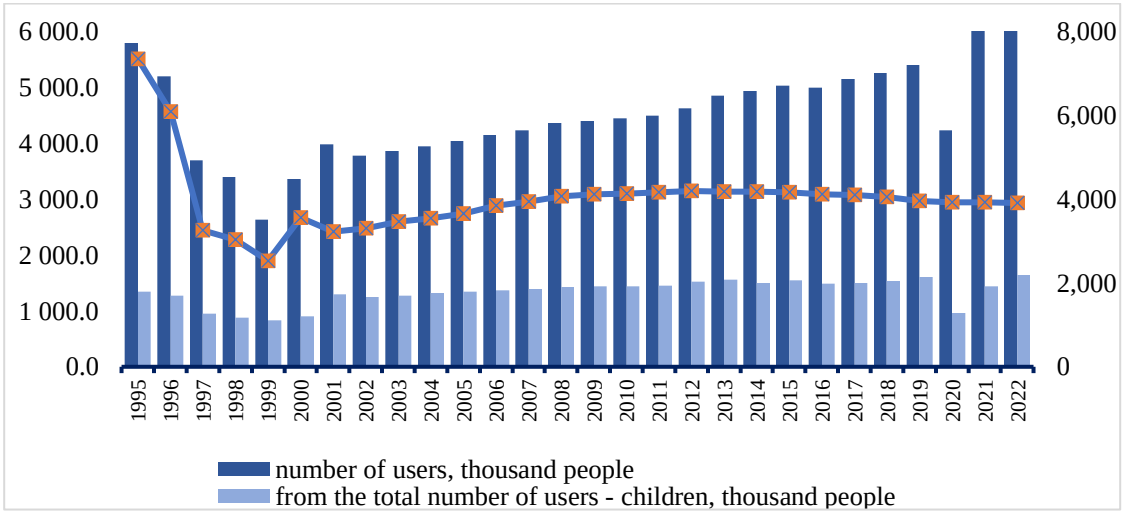

FIGURE 2 – Dynamics of library performance indicators in Kazakhstan for 1995 – 2022

Note: compiled by authors

In terms of the regions of Kazakhstan, the leader in the number of libraries is the Turkestan region (395 libraries) - 10% of the total number of libraries in the country, followed by Kostanay (340) and Akmola regions (339) - 10%, North Kazakhstan region (318) - 8%. In terms of the number of library users, the leaders are Astana (755,189 people) - 12% of the total number of users in the republic, Almaty (515,459 people) - 8%, Jambyl region (345,750 people) – 5,6%.

The number of cultural and leisure organizations in the Republic of Kazakhstan for the period from 1995 to 2022 decreased by 42% from 5342 to 3102, while the number of events held increased by 59% from 123.3 thousand units in 1995 to 196.7 thousand units, the number of amateur art groups increased by 30% from 10,704 units to 13,891 units, the number of amateur art participants increased by 37% from 129,543 people to 177,433 people (see Figure 3).

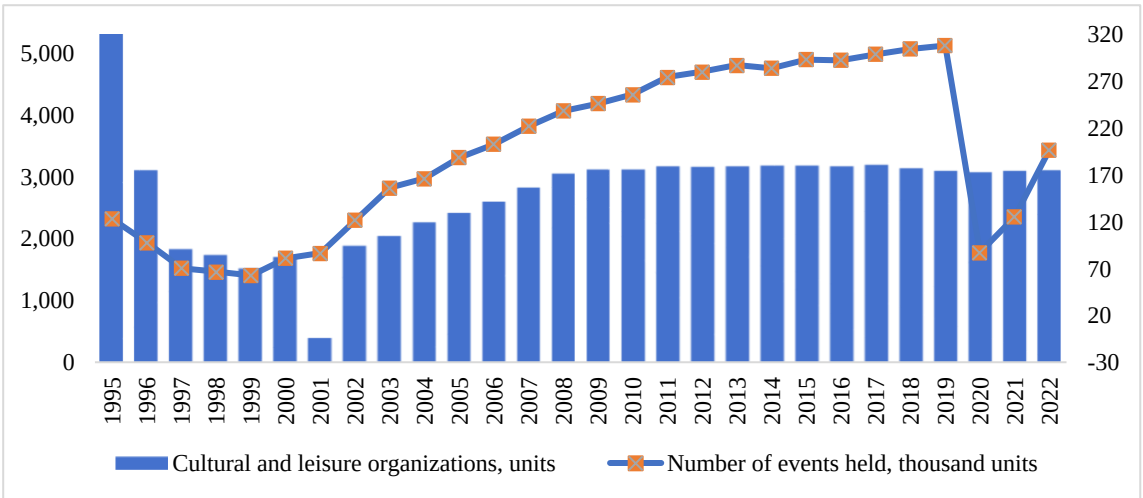

FIGURE 3. Dynamics of performance indicators of cultural and leisure organizations for 1995 -2022

Note: compiled by authors

An analysis of regions by the number of cultural and leisure organizations showed that in 2022, the leaders were Pavlodar (280 units) - 9%, West Kazakhstan (269 units) - 9%, Akmola (261 units) - 8%. During the analyzed period from 1995 to 2022, the number of cinema organizations exhibiting films decreased by 70% from 394 to 118 units, the number of cinemas decreased by 35.6% from 163 to 105 units, the number of visits to film shows increased by 150% from 6800 thousand people up to 17047.5 thousand people (see Figure 4).

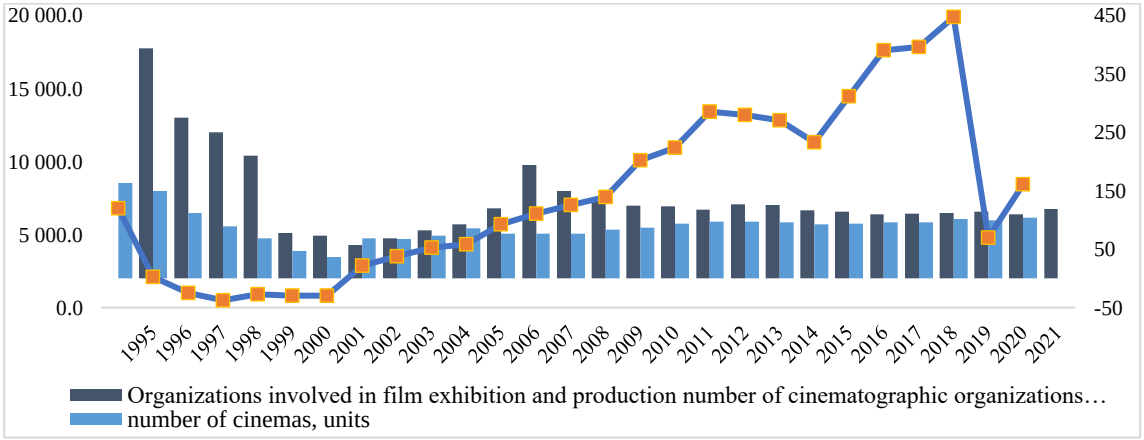

FIGURE 4. Dynamics of performance indicators of organizations engaged in film exhibition and production of films for 1995-2022

Note: compiled by authors

Compared to 2010, the number of cinematographic organizations producing films increased 3.7 times from 18 to 67 units, and the number of films created increased 2.3 times from 144 to 331 units.

In terms of the number of cinemas among the regions of Kazakhstan, the leaders are Almaty (21 units) - 20%, Astana (11 units) - 11%, West Kazakhstan region (9 units) - 9%. Almaty (6,233,139 people) - 37%, Astana (3,551,979 people) - 21%, and Shymkent (1,264,694 people) - 7% are among the regions in the number of visits to film shows in 2022.

Next, Figure 5 visualizes various performance indicators for museums for 1995-2022.

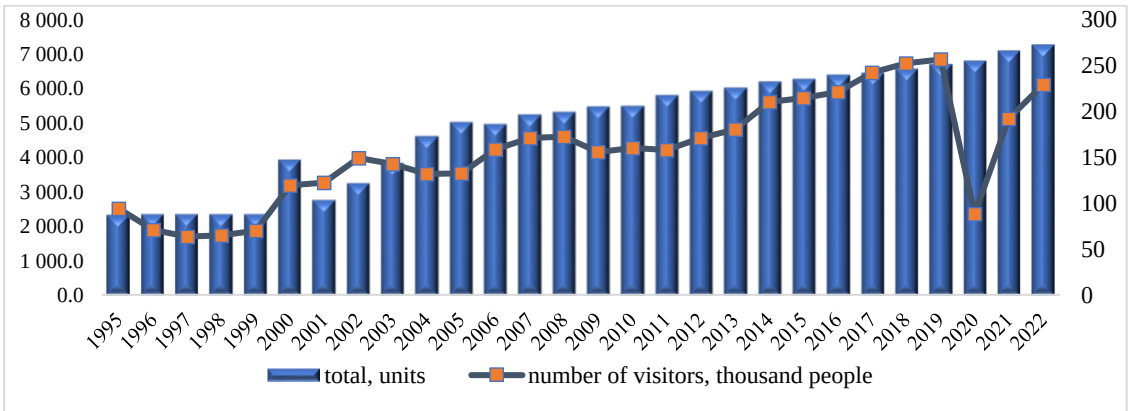

Figure 5. Dynamics of museum performance indicators for 1995-2022

Note: compiled by authors

Analyzing the activities of museums in 2022, the following conclusions can be drawn: the number of museums increased by 3.1 times from 87 units in 1995 to 271 units in 2022, the number of museum visitors increased by 2.4 times from 2500 thousand people to 6097,3 thousand people, the number of exhibits of the leading fund increased by two times from 1295.8 thousand units to 2619.2 thousand units, of which the number of exhibits that were exhibited during the year increased by 2.3 times from 148.2 thousand units to 347 thousand units.

Among the regions of Kazakhstan in the number of museums, the leaders are the Turkestan region (27 units) - 10%, the Aktobe region (20 units) - 7%, the West Kazakhstan region, and the city of Almaty (19 units each) - 7% each. In terms of the number of visits to museums in 2022, among the regions of Kazakhstan, the first positions are taken by the Turkestan region (1492.5 thousand people) - 24%, Astana city (643.1 thousand people) –

11%, East Kazakhstan region (564.8 thousand people) - 9%, Almaty (470.5 thousand people) - 8%.

Table 2 presents statistical data on selected indicators of the socio-cultural environment by region of Kazakhstan as of January 1, 2023. The maximum value was selected as a reference indicator for each evaluated parameter.

TABLE 2. Availability of objects of the socio-cultural environment as of January 1, 2023

Region	**THR**	**MZM**	**CRI**	**CNM**	**LBR**	**CNT**	**PRK**	**ZPK**	**CRS**
Abay region	1	8	125	3	137	1	6	1	0
Akmola region	2	15	261	2	339	0	3	0	0
Aktobe region	2	20	202	2	237	1	9	2	0
Almaty region	2	16	118	0	133	0	11	0	0
Atyrau region	1	16	82	4	143	2	9	0	0
West-Kazakhstan region	2	19	269	9	362	3	11	0	0
Jambyl region	3	17	199	5	275	1	13	0	0
Zhetisu region	0	14	134	2	149	3	1	0	0
Karaganda region	4	16	255	8	257	1	19	1	0
Kostanay region	4	9	244	7	340	1	9	0	0
Kyzylorda Region	1	14	172	2	209	2	3	0	0
Mangistau region	2	7	42	6	68	1	10	0	0
Pavlodar region	2	12	280	5	228	1	4	0	0
North-Kazakhstan region	3	13	240	4	318	1	6	2	0
Turkestan region	3	27	252	3	395	0	27	0	0
Ulytau region	0	6	43	0	57	1	2	0	0
East Kazakhstan region	1	9	172	3	170	1	5	2	0
Astana city	9	9	1	11	23	4	22	0	1
Almaty city	23	19	1	21	33	17	20	2	1
Shymkent city	6	5	10	6	44	1	18	1	1
Reference value	**23**	**27**	**280**	**21**	**395**	**17**	**27**	**2**	**1**
Weight coefficient	0,2	0,2	0,2	0,2	0,2	0,1	0,1	0,05	0,05

Note: compiled by authors based on Bureau of National Statistics (2022)

The values of the standardized coefficients presented in Table 3 and calculated using formula (7) reflect the degree of proximity to the reference value: the closer the value is to unity, the better the region's value for the corresponding attribute. The values of the standardized coefficient vary from 0 to 1. Based on the values of the standardized coefficients, we can determine how close the position of each region is to the reference value. The use of standardized coefficients allows you to include different characteristics in the analysis and obtain a generalized assessment. Weighting coefficients determine the degree of importance of each indicator in a comprehensive assessment of the socio-cultural environment of the regions. The authors determined their values subjectively since there are no studies of this kind in the literature based on multivariate comparative analysis.

TABLE 3. Matrix of standardized coefficients

Region	THR	MZM	CRI	CNM	LBR	CNT	PRK	ZPK	CRS
Abay	0,043	0,296	0,446	0,143	0,347	0,059	0,222	0,500	0,000
Akmola	0,087	0,556	0,932	0,095	0,858	0,000	0,111	0,000	0,000
Aktobe	0,087	0,741	0,721	0,095	0,600	0,059	0,333	1,000	0,000
Almaty	0,087	0,593	0,421	0,000	0,337	0,000	0,407	0,000	0,000
Atyrau	0,043	0,593	0,293	0,190	0,362	0,118	0,333	0,000	0,000
West-Kazakhstan	0,087	0,704	0,961	0,429	0,916	0,176	0,407	0,000	0,000
Jambyl	0,130	0,630	0,711	0,238	0,696	0,059	0,481	0,000	0,000
Zhetisu	0,000	0,519	0,479	0,095	0,377	0,176	0,037	0,000	0,000
Karaganda	0,174	0,593	0,911	0,381	0,651	0,059	0,704	0,500	0,000
Kostanay	0,174	0,333	0,871	0,333	0,861	0,059	0,333	0,000	0,000
Kyzylorda	0,043	0,519	0,614	0,095	0,529	0,118	0,111	0,000	0,000
Mangistau	0,087	0,259	0,150	0,286	0,172	0,059	0,370	0,000	0,000
Pavlodar	0,087	0,444	1,000	0,238	0,577	0,059	0,148	0,000	0,000
North-Kazakhstan	0,130	0,481	0,857	0,190	0,805	0,059	0,222	1,000	0,000
Turkestan	0,130	1,000	0,900	0,143	1,000	0,000	1,000	0,000	0,000
Ulytau	0,000	0,222	0,154	0,000	0,144	0,059	0,074	0,000	0,000
East Kazakhstan	0,043	0,333	0,614	0,143	0,430	0,059	0,185	1,000	0,000
Astana city	0,391	0,333	0,004	0,524	0,058	0,235	0,815	0,000	1,000
Almaty city	1,000	0,704	0,004	1,000	0,084	1,000	0,741	1,000	1,000
Shymkent city	0,261	0,185	0,036	0,286	0,111	0,059	0,667	0,500	1,000

Note: compiled by authors

The resulting rating scores (Ri), calculated using formula (8), are presented in Table 4. These assessments, taking into account all the analyzed factors, make it possible to determine the ranking places of the regions according to the level of development of the socio-cultural environment. As a result of the study, it was revealed that the leading positions in the socio-cultural environment are occupied by the city of Almaty, Turkestan and West Kazakhstan regions. These regions exhibit high levels of cultural diversity, educational development, accessibility to cultural events, and social infrastructure networks. While, on the contrary, Abay region, the Mangystau region and Ulytau region turned out to be the least developed in terms of the socio-cultural environment, demonstrating low rating scores.

TABLE 4. Rating scores of the regions of Kazakhstan according to the level of development of the socio-cultural environment

Region	THR	MZM	CRI	CNM	LBR	CNT	PRK	ZPK	CRS	Ri	Rank
Abay	0,000	0,018	0,040	0,004	0,024	0,000	0,005	0,013	0,000	0,10	18
Akmola	0,002	0,062	0,174	0,002	0,147	0,000	0,001	0,000	0,000	0,39	6
Aktobe	0,002	0,110	0,104	0,002	0,072	0,000	0,011	0,050	0,000	0,35	8
Almaty	0,002	0,070	0,036	0,000	0,023	0,000	0,017	0,000	0,000	0,15	15
Atyrau	0,000	0,070	0,017	0,007	0,026	0,001	0,011	0,000	0,000	0,13	16
West-Kazakhstan	0,002	0,099	0,185	0,037	0,168	0,003	0,017	0,000	0,000	0,51	3
Jambyl	0,003	0,079	0,101	0,011	0,097	0,000	0,023	0,000	0,000	0,32	10
Zhetisu	0,000	0,054	0,046	0,002	0,028	0,003	0,000	0,000	0,000	0,13	17
Karaganda	0,006	0,070	0,166	0,029	0,085	0,000	0,050	0,013	0,000	0,42	4
Kostanay	0,006	0,022	0,152	0,022	0,148	0,000	0,011	0,000	0,000	0,36	7
Kyzylorda	0,000	0,054	0,075	0,002	0,056	0,001	0,001	0,000	0,000	0,19	13
Mangistau	0,002	0,013	0,005	0,016	0,006	0,000	0,014	0,000	0,000	0,06	19
Pavlodar	0,002	0,040	0,200	0,011	0,067	0,000	0,002	0,000	0,000	0,32	9
North-Kazakhstan	0,003	0,046	0,147	0,007	0,130	0,000	0,005	0,050	0,000	0,39	5
Turkestan	0,003	0,200	0,162	0,004	0,200	0,000	0,100	0,000	0,000	0,67	2
Ulytau	0,000	0,010	0,005	0,000	0,004	0,000	0,001	0,000	0,000	0,02	20
East Kazakhstan	0,000	0,022	0,075	0,004	0,037	0,000	0,003	0,050	0,000	0,19	12
Astana city	0,031	0,022	0,000	0,055	0,001	0,006	0,066	0,000	0,050	0,23	11
Almaty city	0,200	0,099	0,000	0,200	0,001	0,100	0,055	0,050	0,050	0,76	1
Shymkent city	0,014	0,007	0,000	0,016	0,002	0,000	0,044	0,013	0,050	0,15	14

Note: compiled by authors

Despite the identified differences, it is essential to note that each region of Kazakhstan has the potential for the dynamic development of the socio-cultural environment. Focusing on improving educational programs, supporting cultural and arts initiatives, and developing social infrastructure can help lift the rankings of lower-level areas.

Ensuring uniform development of cultural infrastructure across all regions of Kazakhstan is imperative for fostering national unity, preserving cultural heritage, and promoting social cohesion. A balanced distribution of cultural resources and facilities enriches residents' lives and contributes to the nation's overall development and prosperity.

Figure 6 presents the rating scores of Kazakhstan's regions according to the socio-cultural environment's level of development, based on the results of a multidimensional comparative analysis.

Regional disparities in cultural infrastructure can exacerbate social and economic inequalities, creating barriers to access and participation in cultural activities. By investing in theaters, museums, libraries, and other cultural institutions in every region, the government can stimulate economic growth, and enhance the quality of life for all citizens.Furthermore, a comprehensive approach to cultural development promotes diversity and inclusivity, allowing each region to showcase its unique identity and heritage. This not only strengthens the nation's cultural fabric but also fosters a sense of pride and belonging among residents.

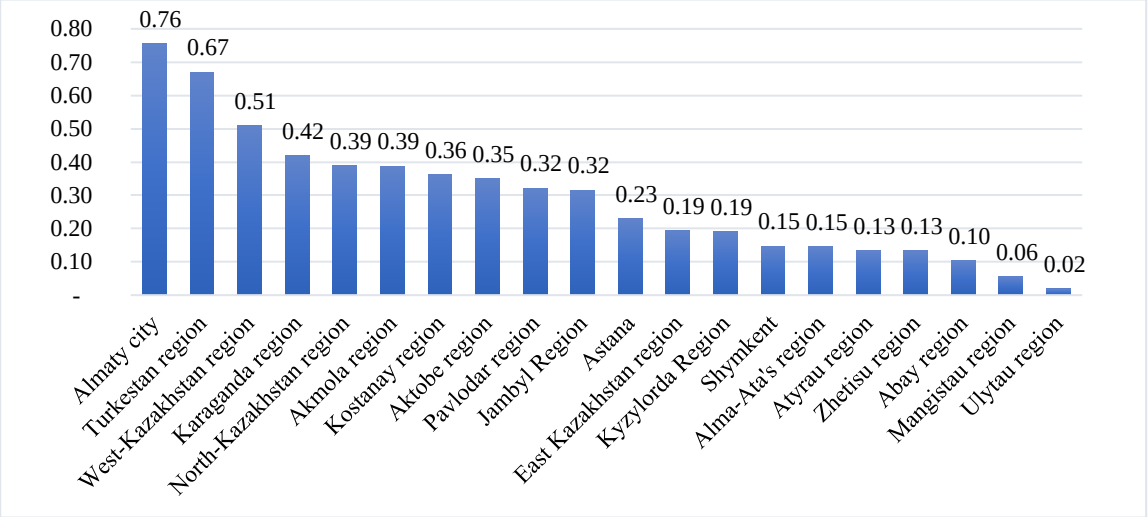

FIGURE 6. Rating scores of the regions of Kazakhstan according to the level of development of the socio-cultural environment

Note: compiled by authors

Moreover, equitable access to cultural infrastructure facilitates cultural exchange and dialogue, fostering mutual understanding and respect among diverse communities. It creates opportunities for collaboration and creativity, driving innovation and progress across all sectors of society.

In conclusion, achieving uniform development of cultural infrastructure in the regions of Kazakhstan is essential for building a vibrant and resilient society. By prioritizing cultural investment and promoting inclusivity, Kazakhstan can realize its full cultural potential and create a more prosperous and harmonious future for all its citizens.

5. CONCLUSIONS

In conclusion, it can be noted that the method of multidimensional comparative analysis used by the authors as a method of comprehensive analysis and rating assessment of the socio-cultural environment of the regions of Kazakhstan made it possible to conduct a detailed analysis of the regions according to selected factors and obtain the rating positions of the regions. This study found marked differences in sociocultural benefits between regions, with notable differences such as the predominance of cinemas and theaters being more pronounced in large urban centers compared to the presence of libraries and museums, which show less differentiation.

Through careful analysis, the study provided insight into each region's relative strengths and weaknesses, resulting in a comprehensive ranking of their level of sociocultural development. Based on the results of multidimensional comparative analysis, Almaty, Turkestan region, and West Kazakhstan region they were emerged as the leaders. In contrast, Abay, Mangistau, and Ulytau regions scored lower, indicating areas requiring close attention and strategic intervention at the state level to strengthen their cultural infrastructure. Furthermore, increase your sociocultural activity.

In further research, the authors plan to expand the scope of analysis, considering the versatility of the sociocultural environment. Thus, expanding the range of studied characteristics will allow us to understand cultural dynamics in more detail and contribute to adopting informed political decisions aimed at promoting balanced sociocultural development in all regions of Kazakhstan.

AUTHOR CONTRIBUTION

Writing – original draft: Zhanar Zh. Yeszhanova.
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Development of research methodology: Zhanar Zh. Yeszhanova.
Resources: Temirlan Abdykadyr.
Software and supervisions: Zhanar Zh. Yeszhanova.
Data collection, analysis and interpretation: Temirlan Abdykadyr.
Visualization: Zhanar Zh. Yeszhanova, Temirlan Abdykadyr
Writing review and editing research: Zhanar Zh. Yeszhanova.

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Assessing of Socio-Economic Determinants of the Availability of Medical Services in Kazakhstan

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ABSTRACT

The frequent visits to doctors and their impact on healthcare providers' workload is a significant concern in many countries, including Kazakhstan, where this topic has been understudied. This research aimed to identify key socio-economic factors influencing the frequency and likelihood of individuals seeking medical care. Utilizing sociological, statistical, and comparative research methods, we conducted a survey involving 1838 participants across 20 regions in Kazakhstan. Our statistical analysis included the calculation of Pearson and Kendall correlation coefficients to evaluate relationships between variables such as the frequency of doctor visits and individuals' health assessment practices, their attentiveness to health, and their responses to illness. The findings reveal that individuals who are proactive in seeking medical advice when symptoms appear also tend to visit doctors more frequently throughout the year. Moreover, socioeconomic factors such as drug costs, demographic characteristics, and travel time to medical facilities were identified as influencing factors, albeit to a lesser extent compared to health status assessment and medical examinations. This study provides a foundational understanding of the factors driving medical visits in Kazakhstan, highlighting the interplay between personal health practices and healthcare utilization. This insight is crucial for planning and optimizing healthcare resource allocation and addressing healthcare accessibility and inequality. The study did not identify any significant limitations for future research.

KEYWORDS: Population, Healthcare, Health Economics, Socio-Economic Factors, Health Behavior, Kazakhstan

SCSTI: 06.71.47

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1. INTRODUCTION

The study context is essential for better understanding the dynamics and effectiveness of the Kazakh healthcare system. This study will help assess how evenly health services are distributed among different groups of people so that inequalities in health care can be combated. The results obtained help determine which patients seek medical help more often and what motives motivate them to do so more often. Understanding these two factors can contribute to effective planning in the healthcare system, optimally allocate limited resources, identify groups of patients with a high probability of illness, and identify categories of people with low access to medical care. The study is essential for the health care system and public health, as well as for ensuring equal access to health services. It should be noted that at the moment, the topic of interaction between the patient and the doctor, the likelihood and frequency of the patient's visit to the doctor, has not been sufficiently studied in Kazakhstan. The lack of research often leads to poor awareness of the issue. It makes it challenging to implement effective health interventions, such as efforts to reduce inequalities in access to health services.

According to the new rules, starting in April 2024, Kazakhstanis can get an appointment with specialized specialists without going through a therapist. Only a specific part of the population may have such a privilege, namely people with injuries and emergency conditions, people registered at a dispensary, people in need of urgent dental care, and people with suspected venereological, skin, and oncological diseases. It is also possible not to take a referral from a therapist if the patient has made an appointment with a cardiologist, psychologist, neurologist, endocrinologist, surgeon, ophthalmologist, obstetrician-gynecologist, specialists in youth health centers, specialized specialists for a repeat appointment according to his appointment, specialists of mobile medical complexes and mobile services (Adilet, 2024). With limited healthcare resources and a shortage of medical personnel, there is an acute problem of the high workload of medical workers, leading to professional burnout. According to regulations, the workload of a general practitioner in Kazakhstan should not exceed 1,700 people, and the workload of a local therapist should be 2,200 people per assigned area. In 2022, the workload of general practitioners in Kazakhstan amounted to 1,838 people. In 2023, the average workload per general practitioner was 1,808 people, while staffing did not exceed 87% (Ministry of Healthcare, 2024). However, IMD's annual competitiveness reports indicate that Kazakhstan's performance has been trending worse for several years on another indicator, "population density per doctor". So, if in 2018, the population density per doctor in Kazakhstan was 270.01 people, then in 2022, this figure increased to 380.18 people (IMD, 2022). It is worth noting that the rating considers all doctors, regardless of citizenship, who are licensed to work in public or private clinics, except dentists. Undoubtedly, an increase in population density per doctor affects an increase in his workload, which in turn can lead to various problems, ranging from professional burnout to the doctor's dismissal from a medical institution. Analyzing another important indicator "population per doctor/nurse" calculated by IMD, it is worth noting the deterioration of this indicator in recent years in Kazakhstan. Thus, since 2018, the "population per doctor/nurse" has increased from 194.26 people to 251.96 people in 2022. If Kazakhstan took 13th place in the IMD ranking in 2018 in terms of "number of population per doctor/nurse", then in 2022 Kazakhstan dropped to 35th place in the ranking (IMD, 2022).

Thus, the study aims to identify the influence of socioeconomic factors on the frequency and likelihood of the population visiting doctors. This study not only explores how socio-economic status, education, and access to healthcare impact the frequency of doctor visits but also examines the broader implications of these visits on the healthcare system's efficiency and the distribution of medical resources. Data analysis on income, education, access to medical services, and other

socio-economic indicators of patients allows us to identify the relationship between these indicators and the regularity of medical treatment. The significance of this research lies in its potential to inform policy decisions and healthcare management practices that aim to enhance the effectiveness of health service delivery and reduce inequalities. By identifying which demographic groups are most likely to seek medical help and understanding the underlying motives and barriers, healthcare providers and policymakers can better tailor their strategies to meet the needs of the population. Moreover, the study's findings can contribute to the development of interventions that target under-served groups, ensuring more equitable access to healthcare services across different regions and socio-economic segments of Kazakhstan.

2. LITERATURE REVIEW

A study conducted by Islam and Awal (2020) notes that the number of doctor visits in public medical institutions is influenced by factors such as patients' financial condition, satisfaction with doctors' work, accessibility, and satisfaction with medical services. In Bangladesh, the unsatisfactory quality of medical services and distrust in public and private medical institutions have contributed to the development of medical tourism in neighboring countries (Andaleeb et al., 2007).

A better understanding of the factors influencing physician visits can help healthcare managers identify over or under-services. Personal qualities of patients, such as extraversion and neuroticism, directly affect the likelihood of visiting a doctor (Hajek & König, 2020). For example, neurotic patients with poor self-esteem of health visit the doctor more often than other categories of neurotic patients. There is also a category of patients who associate their health status with external factors (external locus of control) and may assume that frequent visits to the doctor will have a positive effect on their health (Hajek & König, 2017). The likelihood of visiting a doctor is even influenced by such factors as a decrease in the level of subjective well-being and a low level of optimism (Hajek & König, 2019). In addition, social isolation or a patient's crisis of meaning in life may also influence the likelihood of visiting a doctor (Cruwys et al., 2018).

Lueckmann et al. (2020) analyzed the frequency of visits to specialists and general practitioners in populations of different socioeconomic backgrounds. So, according to the study, people with low socio-economic status, distance, and waiting time for an appointment have the most significant weight when visiting specialists. Populations with a low socio-economic status are less likely to visit specialists, unlike populations with a high socio-economic status. However, a study by Dowd & Zajacova (2010) argues that patients' higher levels of education may bias self-rated health scores because such patients are more critical of their level of subjective health. Among older people, older women, older people with good physical activity, and older patients with poor self-rated health are the most likely to see doctors (Wickramarachchi et al., 2022).

Several studies show various reasons for the decreased likelihood of the population visiting doctors in medical institutions. Thus, in a study by Taber and others (2015), the following reasons are noted: low demand for medical services due to possible recovery, lack of financial resources and time, lack of insurance, high cost of medical services, and low qualifications of doctors. Another study notes that patients do not visit doctors because of difficult financial situations, living in rural areas, and undesirable and adverse events in life (Chapman et al., 2022).

Several studies link frequent doctor visits with patients' psychological characteristics. Hence, women who experience depression during pregnancy or after childbirth are more likely to visit the doctor (Chee et al., 2008). A study by Guo et al. (2017) shows that depression, sleep quality, and pain are associated with frequent doctor visits.

A study conducted in China shows the problem of a high workload of doctors from high-level medical institutions and an

insufficient workload of doctors from lower-status medical institutions. The authors believe that the introduction of co-payment for doctor visits can reduce the workload at high-status medical centers; differentiated payment can increase the likelihood of visiting inexpensive doctors, especially among older people and people with chronic diseases (Wang et al., 2023). In 2013, Cyprus introduced co-payments for emergency care visits, allowing the health system to refer non-emergency patients to primary healthcare facilities (Petrou & Ingleby, 2019).

Research on patient visits to doctors in Kazakhstan is not so widespread in the scientific literature. A study conducted at one of the medical institutions in Astana notes the importance of patient trust in the likelihood of visiting a doctor (Zhumadilova et al., 2018). A study conducted in Almaty examines various factors of self-assessed health among migrant workers and their impact on the receipt of medical services (Kumparatana et al., 2017). Among primary care physicians, the probability of professional burnout was higher for those who had additional work. This fact hurts patients (Migina et al., 2023).

An analysis of the literature touching on the frequency and likelihood of the population visiting doctors shows that the frequency and likelihood of visiting doctors depend on several factors, including the socioeconomic status of the patient, the psycho-emotional state of the patient, the quality and availability of services and organizational aspects of healthcare. Thus, the low socioeconomic status of the patient negatively affects visits to the doctor, especially visits to specialists, due to the long wait for an appointment and the long distance to the medical facility. Such psycho-emotional characteristics of patients, such as neuroticism, extraversion, depression, etc., may affect the increase in the frequency and likelihood of visiting a doctor. The low quality and inaccessibility of medical services contribute to the outflow of patients to better medical institutions, including foreign ones. Factors such as health insurance, cost of medical services, medical and physician staff qualifications, and co-payment mechanisms can influence the frequency and likelihood of patient visits. A review of the literature showed the need to take into account the various characteristics of patient behavior in different countries, including the need to consider the population's mentality. It is also worth considering the multiple factors influencing physician visits to develop effective interventions and strategies to improve access and quality of healthcare services and reduce healthcare inequalities.

3. METHODOLOGY

We conducted a sociological survey among the population of 20 regions of the Republic of Kazakhstan, including in new administrative units (Abai, Zhetysu, and Ulytau regions). The method of collecting information was a questionnaire survey, the total population of respondents was 1638. The majority of respondents (59%) lived in cities, 28.2% lived in rural areas, and 12.8% lived in cities remote from regional centers. The majority of respondents, 64.3%, were women, and 35.7% of respondents were men. The age range of respondents was: 16-17 years old 12.3%; 18-24 years old 53%; 25-34 years old 13.6%; 35-54 years old 16.7%; 55-64 years old 3.4%; respondents over 65 years old 1%. Among the respondents, 51% had higher education, 36.1% had incomplete higher and secondary specialized education, and 12.8% had incomplete secondary and secondary education. Of the respondents surveyed, 39.9% worked; 4.8% had a household; 6.5% did not work due to age and disability; on maternity leave and unpaid leave, 4.2%; 39.9% studied; 4.7% of respondents did not work. 36.4% of respondents were married, 5.5% were divorced or widowed, and 58.1% were unmarried. In total, respondents were asked 26 questions, including information about health, doctor visits, access to medical care, socioeconomic characteristics of the respondents, etc. The sociological survey was conducted from February to March 2023.

Based on the survey results, this research posits the following hypotheses for examination:

H1: Insufficient access to quality healthcare significantly contributes to health issues among vulnerable populations, perpetuating disparities between economically advantaged and disadvantaged groups.

H2: A proactive health mindset, characterized by a responsible and sometimes excessive concern for one's health (akin to hypochondria) and a paternalistic view towards medical care, significantly increases the frequency of doctor visits.

To validate these hypotheses, correlation analysis was employed as a principal statistical method. This involved utilizing Pearson's product-moment correlation coefficients for variables quantified on interval scales and calculating Kendall's rank correlation coefficients for those measured on ordinal scales. Additionally, an ordered logistic regression model was implemented to assess the probability of doctor visits based on various independent variables. These included the patient's self-assessed health status, tendencies towards self-medication, the proximity to healthcare facilities, and the financial costs associated with medical care.

The analytical approach adopted ensures a robust examination of the correlations between socio-economic factors and healthcare utilization, thus providing a quantitative foundation for addressing the hypothesized health disparities and behavioral influences on medical consultations.

4. FINDINGS AND DISCUSSION

Tables 1, 2, and 3 provide detailed results from a sociological survey concerning participants' perceptions and attitudes towards their health. Specifically, Table 1 documents responses to the query, "How do you assess the state of your health?" Results indicate that a majority of respondents, 57.5%, reported their health as "good." A further 33.3% described their health as "average," while 6.5% considered their health "poor." Additionally, 2.7% of participants were unable to provide an assessment of their health status. These findings underscore the varied perceptions of health within the surveyed population, reflecting a spectrum of personal health evaluations.

For a detailed breakdown of survey responses to the question "How do you assess the state of your health?" refer to Table 1.

TABLE 1. Self-Assessment of Health Status by Respondents

Variable		Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	Health is poor	106	6,5	6,5	6,5
	Average state of health	545	33,3	33,3	39,7
	Health is good	942	57,5	57,5	97,3
	I find it difficult to answer	45	2,7	2,7	100,0
	Total	1 638	100,0	100,0	

Note: compiled by authors

The data is structured to show the frequency and percentage distribution of responses across four categories. The cumulative percentages of data illustrate a progressive accumulation of responses, culminating in 100% with those who found it difficult to answer.

The obtained data of categories the respondents' levels of health consciousness as follows. A significant portion of respondents indicated that they primarily focus on maintaining their health. Many respondents reported a general commitment to their health. Some admitted to having minimal concern for their health.

Next, Table 2 documents the responses to the survey question "To what extent do you care about your health?"

TABLE 2. Extent of Health Care Engagement Among Respondents

Variable		Frequency	%	Valid, %	Cumulative, %
Valid	I don't care at all	73	4,5	4,5	4,5
	I don't care much	398	24,3	24,3	28,8
	Mostly I care	682	41,6	41,6	70,4
	I care	454	27,7	27,7	98,1
	I find it difficult to answer	31	1,9	1,9	100,0
	Total	1 638	100,0	100,0	

Note: compiled by authors

A smaller group stated that they do not care about their health whatsoever. This distribution provides insights into the varying degrees of health attentiveness among the surveyed population, highlighting a significant portion that is actively engaged in health management, alongside a noticeable fraction displaying apathy towards health issues.

Table 3 presents respondents' answers to the question "Based on what you assess the state of your health?".

TABLE 3. Criteria for Self-Assessment of Health Status by Respondents

Variable		Frequency	%	Valid, %	Cumulative, %
Valid	Based on medical examination	1	0,1	0,1	0,1
	Based on medical examination and well-being	322	19,7	19,7	19,7
	Based on well-being	524	32,0	32,0	51,8
	Milk and honey	788	48,1	48,2	99,9
	Psychosomatics	1	0,1	0,1	100,0
	Total	1 636	99,9	100,0	
Missing	777,00	2	0,1		
Total		1 638	100,0		

Note: compiled by authors

The responses illustrate the criteria used by respondents to evaluate their health status. The predominant method, cited by nearly half of the participants, involved a metaphorical 'milk and honey' approach, indicating an overall perception of well-being and contentment. The next most common basis was personal well-being, followed by assessments that combined medical examinations with personal well-being. A smaller fraction of respondents relied solely on medical examinations. Notably, a negligible number of participants mentioned psychosomatic factors as their assessment criterion. This distribution of responses highlights the varied and subjective nature of health perception among the surveyed individuals.

When analyzing the data, the task was set to find out how closely the studied characteristics are interconnected. To test whether there was a statistically significant relationship between the variables, correlation coefficients were calculated. The relationships studied in Table 4 generally have a weak or weak insignificant relationship with the variable "How often do you visit a doctor during the year".

TABLE 4. Dependencies of Variables on Frequency of Doctor Visits

Researched dependencies	Pearson's Criterion	The power of interconnection	The direction of communication
How would you rate the state of your health	68.942	weak (not significant <0.1)	-
To what extent do you care about your health	225.74	average (0.2-0.4)	+
Based on what do you assess the state of your health	241.71	average (0.2-0.4)	+
Have you been sick in the last 12 months	89.024	weak (not significant <0.1)	+
The last 6 months were shown to a health worker for a medical examination	165.09	weak (0.1-0.2)	+
Where did you go for medical care during the year	414.35	weak (0.1-0.2)	-
How much time do you spend traveling to a medical institution	67.856	weak (0.1-0.2)	-
Do you think that the medical institution lacks specialists in the required profiles	51.069	weak (not significant <0.1)	-
You or a family member need to take medication on a regular basis	35.057	weak (not significant <0.1)	-
Do you purchase medicines or receive them from the state	112.97	weak (not significant <0.1)	+
How much do you spend per month on medicines	44.378	weak (not significant <0.1)	-
What's your gender	13.276	weak (not significant <0.1)	+
Your age interval	76.014	weak (not significant <0.1)	-
Your education	38.048	weak (not significant <0.1)	-
Your main occupation	147.38	weak (not significant <0.1)	-
If you work, in what field	145.29	weak (not significant <0.1)	-
Your marital status	85.342	weak (not significant <0.1)	-
Do you have children in your family	47.392	weak (not significant <0.1)	+
How do you assess the financial situation of your family	151.94	weak (not significant <0.1)	-
Average monthly income per person in a family	53.666	weak (not significant <0.1)	-
Your area of residence	29.016	weak (not significant <0.1)	-
Indicate the region and city in which you live	283.80	weak (not significant <0.1)	-

Note: compiled by authors

The table data suggests that there is a weak, insignificant relationship between the frequency of visiting a doctor and the indicator "How would you rate the state of your health," implying that patients who rate their health as good may not visit doctors as often as other categories of patients. The factors "To what extent do you care about your health" and "Based on what do you assess the state of your health" exhibit an average positive relationship

with the frequency of visiting a doctor. This may be explained by the tendency of patients who care about their health and evaluate its condition to visit doctors more often.

Furthermore, the factor "Have you been sick in the last 12 months" shows a weak but positive relationship, indicating that patients who have been sick are more likely to see a doctor. Similarly, there is a weak but positive relationship with the factor "The last 6 months were shown to a health worker for a medical examination," which can be attributed to a more cautious attitude towards health by the patient. The weak negative relationship between the factors "Where did you go for medical care during the year" and "How much time do you spend traveling to a medical institution" can be explained by patients living at a considerable distance from medical facilities and being dissatisfied with medical care, thus negatively affecting their likelihood of consulting a doctor.

Additionally, a weak but positive connection is observed for the factors "Do you purchase medicines or receive them from the state" and "Do you have children in your family." Such a relationship between these factors may indicate that patients are more inclined to visit a doctor for prescriptions and consultations about medications, and can also be explained by their concern for the health of their children.

Among the studied dependencies in Table 5, the average strength of the relationship is observed for the indicator "I approach the doctors".

TABLE 5. Interrelation of Frequency of Doctor Visits and Actions Taken in Case of Disease

Researched dependencies	Pearson's Criterion	The power of interconnection	The direction of communication
I approach the doctors	159.82	average (0,2-0,4)	+
I use unconventional means	16.394	weak (not significant <0.1)	+
I treat myself with medications and folk remedies	80.246	weak (0.1-0.2)	-
Self-medication and doctor's recommendations	46.396	weak (not significant <0.1)	-
I don't do anything	82.154	weak (0.1-0.2)	-

Note: compiled by authors

There is an average strong positive relationship between approaching doctors and the frequency of doctor visits. This suggests that individuals who regularly visit doctors are more likely to approach healthcare professionals when they fall ill, seeking formal medical assistance. A weak, insignificant relationship is observed between using unconventional means and the frequency of doctor visits.

This implies that using alternative or unconventional methods for treating illnesses does not significantly influence the frequency of doctor consultations. There is a negative relationship between visiting a doctor and self-medication, which suggests that patients who rarely visit doctors are predisposed to trust their treatment methods and do not listen to doctors' recommendations. It is worth noting that the observed variables have a weak or medium strength of relationship, which suggests that other factors influence a person in case of illness.

The data in Table 6 shows an analysis of the relationship between the frequency of visiting a doctor during the year and the reasons prompting patients to seek medical care for a fee.

TABLE 6. Interrelation between Frequency of Doctor Visits and Reasons for Seeking Medical Care for a Fee

Researched dependencies	Pearson's Criterion	The power of interconnection	The direction of communication
The doctor at the hospital at the place of residence refused to issue a referral	141.31	weak (0.1-0.2)	+
There is a long wait to register for diagnostic tests	11.846	weak (not significant <0.1)	+
I want to be served at a high level (quickly and efficiently)	38.419	weak (not significant <0.1)	+
The district polyclinic is far away	13.212	weak (not significant <0.1)	+
Low level of equipment at the district clinic	9.841	weak (not significant <0.1)	+
Lack of necessary medical specialists in the district clinic	10.943	weak (not significant <0.1)	+
High professionalism of doctors in a private clinic	24.956	weak (not significant <0.1)	+
Better organization of work (no queues, etc.)	30.499	weak (not significant <0.1)	-
Attentive attitude of medical staff in a private clinic	13.948	weak (not significant <0.1)	+
Satisfied with the broader range of medical services provided	15.128	weak (not significant <0.1)	+
High quality of medical care in a private clinic	14.079	weak (not significant <0.1)	+
Modern equipment	9.89	weak (not significant <0.1)	+
Specialized institutions (diagnostic centers, etc.)	139.02	weak (0.1-0.2)	+
I did not apply	80.058	weak (0.1-0.2)	-

Note: compiled by authors

Refusal to issue a medical referral by a doctor and referral to specialized institutions have a weak positive relationship. Other factors, such as long waiting times for an appointment for a diagnostic examination, the desire to receive quality care, remoteness of the medical facility, etc., have an insignificant relationship with the frequency of doctor visits. Such a factor as not seeking medical help also has a weak but negative relationship with the frequency of visiting a doctor.

Refusal or problems with calling an ambulance show a weak positive relationship with the frequency of visiting a doctor. This is explained by the fact that having not received or received insufficient medical care services, patients more often turn to doctors. Those portions of the population that had no problems or did not seek emergency medical care had a weak but negative relationship with the frequency of doctor visits, which may mean that they visit the doctor less often over a year. This trend suggests that access to emergency medical services plays a critical role in shaping individuals' healthcare behaviors.

The studied dependencies in Table 7 show a weak, insignificant strength of the relationship between the variables "How often do you visit a doctor during the year" and "If you went to emergency medical care, did you encounter any problems?"

TABLE 7. Relationship Between Frequency of Doctor Visits and Encountering Problems in Emergency Medical Care

Researched dependencies	Pearson's Criterion	The power of interconnection	The direction of communication
The call was not accepted	120.368	weak (0.1-0.2)	+
Very long wait for a response	2.848	weak (not significant <0.1)	+
Lack of available crew on site	9.513	weak (not significant <0.1)	+
Recommendations are given over the phone	1.851	weak (not significant <0.1)	+
Very long wait for the crew	10.014	weak (not significant <0.1)	+
No, there were no problems	26.658	weak (not significant <0.1)	+
I did not apply	48.941	weak (0.1-0.2)	-

Note: compiled by authors

As we can see, the highest indicator of the Pearson Criterion was recorded for the dependence "Where did you seek medical help during the year" (414.35), and the lowest indicator for the dependence "Recommendations were given by telephone" (1.851). The average strength of the relationship (0.2-0.4) was recorded for the variable "How often do you visit a doctor during the year" with the variables "To what extent do you care about your health", "Based on what you assess the state of your health" and "What do you do in case of disease" (answer: I turn to the doctors). With the rest of the variables, a weak or weak insignificant force of the relationship is fixed.

It was tested whether there was a statistically significant relationship between "How would you rate the state of your health?" and "How often do you visit a doctor during the year?". Both variables are measured on an interval scale. At the same time, it should be taken into account that the Pearson correlation coefficient is less robust than the Spearman correlation coefficient, therefore, the Kendall coefficient is also considered.

For variables measured on an ordinal scale, Kendall's rank correlation coefficient values were calculated. Based on this, there is a statistically significant relationship between "What do you do in case of disease" (answer: I turn to the doctors) and "How often do you visit a doctor during the year", in social sciences, a correlation coefficient value of 0.427 can be considered a good indicator.

To estimate the effect of personal characteristics on decisions to visit doctors, we use the ordinal logit model. We treat no visits to doctors at all as a baseline category and interpret the coefficients of the model as determinants of more frequent visits (up to several times a month). One natural explanatory variable is self-reported health state, baseline being Poor, and others, Average, Good, and Unidentified (Hard to say, probably also meaning not bad). Other explanatory variables include actions when ill, with categories None, wait till recovery (baseline), Self-medication, Non-conventional medicine, and going to medical doctor; time required to reach clinic, categories ranging from under 15 minutes (baseline) to more than 2 hours; monthly expenses on drugs, ranging from under 5 thousand KZT to more than 35 thousand KZT, as well as a bunch of sociodemographic characteristics. Another important variable is whether the respondent had a professional health check (as part of their job contract) within the last 6 months. Separate regressions are reported for those who did or who did not perform such health checks, along with the primary regression with controls.

TABLE 8. Frequency of Doctor Visits Based on Base: A Few Times a Month

Researched dependencies	(1) full	(2) screening	(3) No screening
Health (ref: poor) average	0.789***	1.086***	1.000***
	(0.230)	(0.376)	(0.330)
Good	-0.033	0.285	-0.346
	(0.182)	(0.298)	(0.255)
Hard to say	0.197*	0.500***	0.128
	(0.102)	(0.162)	(0.145)
Cure when ill (ref: none) self-medication	-0.787***	-0.971**	-0.663**
	(0.237)	(0.469)	(0.302)
Non-traditional	-1.490***	-1.891***	-1.040***
	(0.279)	(0.518)	(0.380)
Doctor	-1.777***	-1.824***	-1.723***
	(0.242)	(0.468)	(0.316)
Time to clinic (ref:<15min) 15 to 30min	0.221**	0.401**	0.034
	(0.111)	(0.166)	(0.164)
30 to 60min	0.485***	0.441**	0.456**
	(0.131)	(0.202)	(0.186)
1 to 2 hrs.	0.518**	0.157	0.614*
	(0.240)	(0.391)	(0.324)
>2 hrs.	0.928***	0.685*	1.061***
	(0.260)	(0.397)	(0.393)
Drug cost (ref:<5K KZT) 5 to 10K KZT	-0.319***	-0.311*	-0.392**
	(0.114)	(0.182)	(0.159)
10 to 20K KZT	-0.362***	-0.142	-0.602***
	(0.128)	(0.196)	(0.186)
20 to 35K KZT	-0.266	-0.090	-0.685**
	(0.190)	(0.280)	(0.289)
>35K KZT	-0.101	-0.273	-0.321
	(0.201)	(0.287)	(0.326)
Prof med screening (ref: yes)	0.807***		
Hard to say	(0.188)		
No	0.787***		
	(0.098)		
Age category (numeric)	0.008*	0.013**	0.001
	(0.004)	(0.006)	(0.007)
Female	-0.044	0.019	0.001
	(0.069)	(0.108)	(0.099)
Observations	1633	720	792
Residual variance	5063.84	2112.58	2463.45

Note: compiled by authors

Ordinary logit is a proportional model; hence it means that all coefficients are interpreted as linear effects of the respective regressor on the odds of choice of each category relative to the baseline. In particular, the coefficient of self-reported health: average implies that the odds of going to the clinic less often than several times a month is 2.20 (=exp (0.789)) times higher for patients with an average health state than for patients with a poor health state. This makes sense because patients with poorer health are expected to consult doctors more. Interestingly, this does not hold for the patients whose health state is good but is marginally accurate for patients who find it hard to characterize their health state, especially when they have to do a regular medical check as part of their job contract. This fact is expected and can serve as additional evidence that respondents took the survey seriously. Patients who reportedly use self-medication in case of illness, rather than doing nothing, are more likely to see the doctors more often. Their odds of seeing a doctor less likely to see a doctor less often than several times a month are 0.45 (=exp (-0.787)) of the odds of the respondents who do nothing in case of illness. This tendency is even more vital for those who use traditional medicine and especially for those who go to conventional doctors in such cases. These last patients are almost five times 0.22 = exp (-1.77)) less likely to decrease their frequency of doctoral visits in case of illnesses than those who reportedly do nothing in case of illnesses. Interestingly, this tendency is more vital for those who incur regular professional health checks, meaning that people who have regular exposure to such checks also develop some habits of consulting doctors whenever needed. This is confirmed by the dummies of these professional health checks in the primary regression.

Attendance of doctors decreases monotonically with distance to a clinic, even though the significance of the effect varies. In particular, people who live within 60 min of the clinic have their odds of going to the doctor less than a few times a month 1.62 times (=exp (0.485) higher than those who live within walking distance of 15 min. This tendency is true regardless of whether people undergo regular health checks as part of job contracts, although the effects are less significant due to lower sample sizes. Distance is also obviously correlated with residence area (large cities vs countryside); hence, we did not find any significant effect on residence per se, education, income, gender, or age.

Effects of drug costs are also explained that people who spend 5 to 10 thousand tenge on drugs per month are less likely to visit doctors fewer times than those who spend less than 5 thousand (odds ratio is 0.72 (= exp (-0.319)). This means that visits to doctors are accompanied by more drug expenses, probably due to drug prescriptions – but up to a specific limit of less than 20 thousand tenge. Interestingly, this effect is more 'prolonged' for those who do not undergo regular health checks (column 3). For them, the effect holds until the expense of 35 thousand tenge: those people are 6 times less likely to decrease the frequency of their visits to doctors than those who spend less than 5 thousand tenge. One might speculate here that people who are more exposed to doctors through undergoing regular health checks take drug prescriptions somewhat more critically, and not each of their visits to the doctor is accompanied by an increase in drug expenses. However, this intuition has to be discounted by regular health check visits.

Thus, the data reviewed contains coefficient values, standard errors of coefficients, standardized coefficient values, Pearson pairwise correlation coefficients, significance levels, and modeling results using the Ordered Logit model. From the data obtained, it is clear that at a significance level of 0.05, all coefficients are statistically significant: the constant and the coefficient β in front of the variables. According to the results obtained, the variable "How often do you visit a doctor during the year" is most strongly correlated with the following variables "Based on what you assess the state of your health", "To what extent do you care about your health", "What do you do in case of disease" (I approach the doctors). It is worth noting that the ordered

choice model shows that factors such as self-assessment of health status, behavior in case of illness, regular medical examinations, time and distance to a medical facility, as well as the cost of medications have no less influence on the frequency and likelihood of visiting a doctor.

5. CONCLUSIONS

The results of the study showed that a more serious attitude towards one's health and an excessive attitude towards one's health on the part of the patient influence a high likelihood of visiting a doctor. Undoubtedly, such factors affect the increase in the workload of both general practitioners and the workload of specialized specialists. It is also worth considering the paternalistic relationships that arise between some patients and doctors. The presence of paternalistic relationships cansignificantly influence the likelihood of patients visiting their doctor because patients rely entirely on the doctor's qualifications and experience in all matters of medicine.

Using the ordered logit model, we were able to obtain the following conclusions. Respondents who rate their health as "good" or "uncertain" visit a doctor more often than respondents who rate their health as "poor". The use of alternative medicine and self-medication is not significantly associated with the frequency of doctor visits. Having undergone a professional medical examination in the last six months also positively affects the frequency of visiting a doctor, demonstrating the respondents' high responsibility for their health. Factors such as drug costs, socio-demographic characteristics, and time spent traveling to a medical facility can also influence the frequency of the population visiting doctors. However, this influence is less significant than professional medical examination and health status assessment.

The current study aimed to identify socioeconomic factors that influence the population's likelihood of seeking medical attention. The likelihood of a patient going or not going to see a doctor is directly interconnected. It affects many current challenges facing the healthcare system, for example, the excessive workload of doctors, long waiting periods for a doctor's appointment, health inequalities, etc. Thus, the existing problem of insufficient access of a part of the vulnerable population, primarily those uninsured in the health insurance system, to quality medical care, negatively affects the likelihood of visiting doctors; accordingly, this problem can negatively affect the health of this category of the population. Understanding the underlying factors that influence the likelihood of attendance will allow healthcare managers to better design strategies to reduce unfair healthcare disparities.

AUTHOR CONTRIBUTION

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Responsible Production: A Systematic Review and Future Research Directions

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ABSTRACT

Responsible production (RP) aims to minimize negative consequences of active economic growth by producing and using resource-efficient and energy-efficient products and processes that have a minimal negative impact on the environment and are safe for employees, the community, and consumers. Despite the relevance of the RP concept, there are no systematic literature reviews containing thematic mapping and thematic evolution of research in this area. Therefore, this study aims to identify relevant research areas, research interests' current state and evolution, and potential future research directions on RP topics. A systematic review approach and content analysis were applied to achieve the study's aim. To conduct a systematic review, a search was carried out for keywords such as “responsible production" OR “sustainable production”. Then, further filtering by such criteria as subject category, document type, and publication language took place. As a result, bibliographic data from 858 papers became a research basis for descriptive analysis. Data were derived from the Scopus database. The Biblioshiny tool was used for systematic review. Finally, the most relevant research areas were identified, including sustainable supply chains, consumer behavior in the context of RP, and the impact of Industry 4.0 on the realization of RP principles. According to the systematic review results, scientific activity in RP research has increased significantly. The role of supply chain management in achieving RP principles is notable. The environmental aspects of RP, environmental management, and environmental performance are particularly relevant.

KEYWORDS: Responsible Production, Sustainable Economic Growth, Sustainable Development, Thematic Mapping, Thematic Evolution

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JEL Code: Q20, Q32, Q50

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1. INTRODUCTION

Current production systems based on traditional practices and commercial technologies are generally unsustainable. The industrial sector, through its role in society, has contributed significantly to pollution and exploitation of the environment. The accelerated industrialization of most countries and the associated rapid environmental degradation have raised concerns about the unsustainability of current growth patterns (Tseng et al., 2013). The concept of responsible production is aimed at mitigating the harmful environmental and social consequences of economic activity through the manufacture of products and services, the use of processes and systems that generate a minimum of harmful emissions, save energy and natural resources, are economically feasible, safe for employees, the community and consumers and provide favorable social and creative conditions for the entire working population (The Lowell Center Framework for Sustainable Products, 2009).

Despite the undoubted relevance of the responsible production concept, there is a lack of systematic literature reviews containing descriptive analysis, thematic evolution, and mapping of the present state of research on this topic. The current review aims to fill these gaps by applying descriptive bibliographic analysis containing thematic mapping and thematic evolution. Additionally, the existing reviews along with the concept of responsible production deal with the concept of responsible consumption. The current review focuses only on the responsible production concept. Besides, the environmental aspects of responsible production are the primary research object in existing reviews. This review seeks to cover both the environmental and social aspects of responsible production.

Therefore, this study aims to undertake a systematic literature review that contains a descriptive part and content analysis. The R-package Bibliometrix, Biblioshiny tool (Aria & Cuccurullo, 2017; Biblioshiny) was applied for the descriptive part of the review. The aim of the current research is to identify relevant research areas, research interests' current state and evolution, and potential future research directions on responsible production topics. The research question identified was “What is the current focus of scientific interest in responsible production research?”

In order to provide an answer to this research question, the structure of the current paper is as follows: the data collection and sampling methodology is reflected in Section 2. The research results and discussion are presented in Section 3 by building thematic maps and networks, identifying thematic evolution, and content analysis of the most influential papers. Section 4 provides conclusions and future research directions.

2. LITERATURE REVIEW

A few papers have conducted literature reviews on the concept of responsible production. For instance, Roy and Singh (2017) conducted systematic literature review on sustainable production and consumption (SPaC). They revealed the business focus in SPaC literature revolving around five critical themes like the conceptualization of SPaC, the governing role of policy frameworks in the initiation and focus in SPaC literature, the guidance of SPaC transformation, strategic implementation issues, operational implementation issues and maintaining the progress of implementation. However, Roy and Singh (2017) did not include bibliographic analysis in the form of a co-occurrence network, thematic evolution, and thematic mapping in their review. Moreover, as part of the review, the authors consider sustainable production and sustainable consumption concepts together. The authors use “sustainable production” as a keyword for publication searches, thus focusing mainly on the environmental aspects of responsible production.

Bonvoisin et al. (2017) provided a structured overview of the research field in sustainable manufacturing with a particular focus on manufacturing technology and management. The authors highlighted

challenges in four research areas, mainly manufacturing technologies, product development, value creation networks, and global manufacturing impacts. In their study, the authors focus on the technological aspect of sustainable production. Moreover, the review does not contain a descriptive analysis in the form of thematic mapping and thematic evolution analysis.

Lukman et al. (2016) conducted a content analysis of 13 papers that focus on sustainable consumption and production (SCP), identified further challenges, and provided solutions related to resource efficiency (ReE), sustainable water systems, sustainable management, cleaner production (CP), and sustainable urban development. However, there is no bibliographic and descriptive analysis in their research. Also, within the framework of this review, the authors consider the concepts of sustainable production and consumption concurrently.

Thus, a few available reviews on sustainable production do not contain a descriptive bibliographic analysis, including thematic maps and thematic evolution. Moreover, the existing reviews consider the concepts of responsible production together with the concept of responsible consumption, and focus mainly on the environmental aspects of responsible production. The current review seeks to fill these gaps by applying descriptive bibliographic analysis containing thematic mapping and thematic evolution. In addition, this study considers both aspects of responsible production, namely environmental and social.

2. METHODOLOGY

The methodology of the systematic literature review is based on various established practices in the field of bibliometrics and systematic review.

1. Systematic Literature Review - is commonly used in various academic fields to synthesize the research on a given topic comprehensively. It involves a structured search and selection process to collect relevant literature and critically analyze its content. This approach is influenced by the general principles outlined in academic works on conducting systematic reviews.

2. Descriptive Bibliographic Analysis includes techniques such as thematic mapping, thematic evolution, and co-occurrence networks. These methods are rooted in bibliometrics and scientometrics, fields that study the quantitative aspects of academic literature. Thematic mapping and thematic evolution are methods used to visualize the development and relationships between themes in a body of literature over time. Co-occurrence networks visualize how key terms or concepts within a literature corpus relate to one another.

3. Content Analysis of Influential Papers is based on citation counts to analyze their content is a common method in bibliometric studies. It helps identify the most impactful studies within a field or topic and analyze trends and patterns in research themes.

4. Use of Biblioshiny for Descriptive Analysis is an application of the R-package 'Bibliometrix', which is specifically designed for comprehensive science mapping analysis. This tool supports the implementation of the bibliometric and scientometric methods mentioned above, providing capabilities for data visualization and analysis that are integral to systematic reviews in academic research.

The overall methodology is influenced by the need for a comprehensive and systematic approach to analyze literature on responsible and sustainable production. The combination of systematic literature review techniques with bibliometric analysis tools allows for a detailed exploration of both the environmental and social aspects of production, aiming to fill gaps identified in previous literature reviews. Such an approach is aimed at ensuring that the findings are robust, reproducible, and provide a clear picture of the current state of research in the field.

The initial search results, in the context of current study, included articles published up to and including February 2024. The basic search query applied keywords such as “responsible production" OR "sustainable production". As a result, 13,168 papers were generated.

Along with “responsible production", we used the keyword “sustainable production”, which is tightly linked to the responsible production concept and is commonly used in the scientific literature. The responsible production concept is aimed at studying both the environmental and social aspects of production, while the sustainable production concept focuses mainly on environmental issues (Alayón et al., 2017). Thus, the inclusion of the word “sustainable production” along with “responsible production” in the search query is explained by the intention to fully consider both the environmental and social aspects of responsible production and ensure the most comprehensive coverage of publications.

A brief reflection of key analysis stages is depicted in Figure 1. The search query in the Scopus database was conducted within the title of the article, the abstract, and keywords. Then, the obtained results were restricted to business, management, and accounting subject categories; this step generated 1,231 papers. Article or review document type selection was the next stage, which gave 913 outcomes. The last stage was publication language choice, for review papers in English were chosen. This step yielded 858 papers, and this final sample was the focus of a descriptive analysis. Biblioshiny software was used for descriptive analysis.

For content analysis, 15 most influential papers (according to total citations) were selected (Annex 1).

The systematic literature review is comprised of two distinct sections. Initially, the review undertakes a descriptive analysis, which utilizes a substantial collection of 858 papers sourced from the Scopus database. This analysis encompasses several fundamental components, including the co-occurrence network, thematic mapping, and thematic evolution, among others.

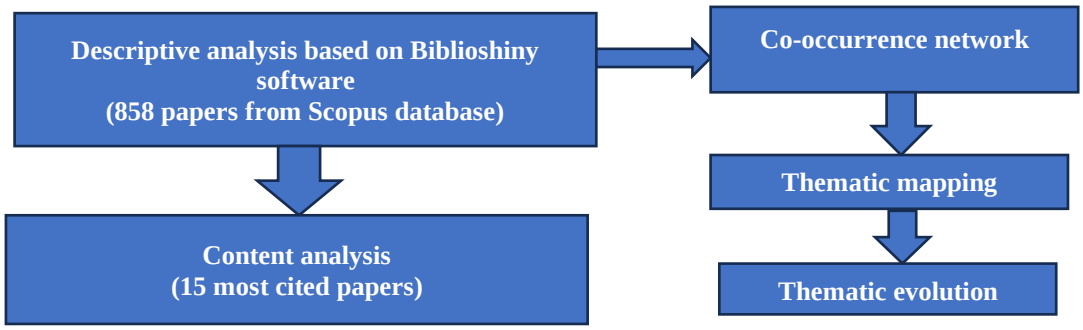

FIGURE 1. Stages of analysis

Note: compiled by authors

Subsequently, the second section of the review focuses on content analysis, which is conducted on the 15 most cited papers, as determined by their total citation count. This methodical approach ensures a comprehensive examination of the existing literature.

3. FINDINGS AND DISCUSSIONS

The current section of the review contains a descriptive analysis followed by a content analysis. The descriptive analysis is based on the selection of 858 articles derived from the Scopus database.

The descriptive analysis reveals the dynamics of scientific production in the studied field (Figure 2), the core journals involved in the study of responsible production (Figure 3, Figure 4), and the scientific influence of countries in the field of responsible production (Figure 5, Figure 6). Also, within the framework of the descriptive analysis, trend topics, the current state and evolution of scientific interests in the field of responsible

production in the form of thematic maps are identified. Figure 2 shows the dynamics of annual scientific production on responsible production.

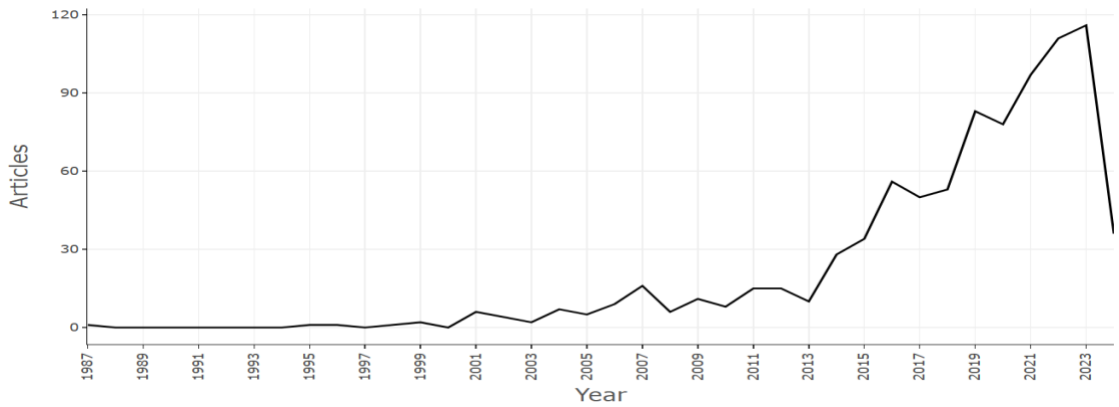

FIGURE 2. Annual scientific production

Note: compiled by authors based on Bibliometrix Biblioshiny tool

Annual scientific production

The graph shows that from 1987 to 2000, there were almost no articles on this topic, except occasional articles appearing in some years. The next period on the graph from 2001 to 2013 is characterized by a smooth and stable increase in publication activity on responsible production, which indicates the gradually increasing scientific interest in this topic. During this period, the number of publications averaged about 10, with peak publication activity in 2007. After 2013, there has been an explosive increase in the number of publications on responsible production. In 2014, more studies were published than in the previous two years. This trend of steady and steep publication activity growth occurred until 2023. It will likely continue in 2024: 36 articles have already been published in the first quarter of 2024, as in 2015.

Core sources are shown in Figure 3 and Figure 4. Figure 3 shows most relevant sources.

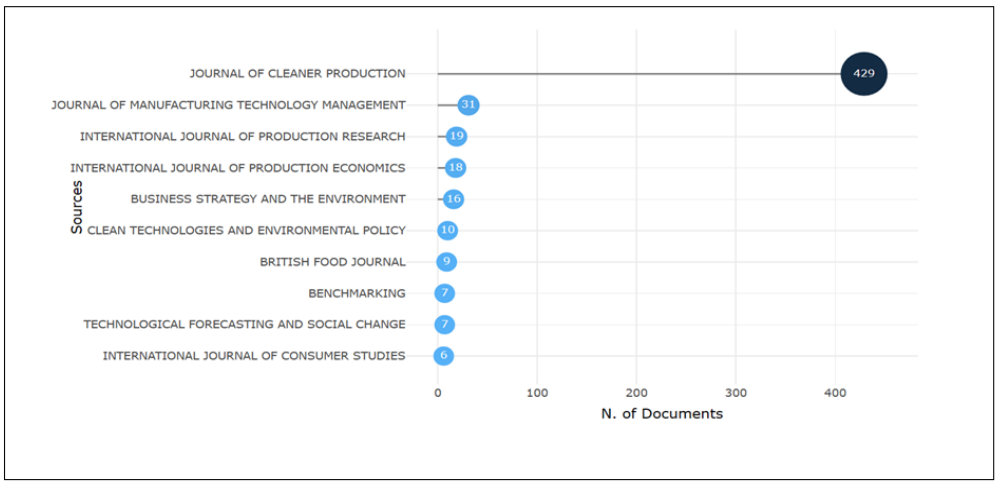

FIGURE 3. Most relevant sources

Note: compiled by authors based on Bibliometrix Biblioshiny tool

Most relevant sources

The publication core of the topic is the Journal of Cleaner Production. It contains half of the entire analyzed collection. By a considerable margin, with 31 publications on the topic, the Journal of Manufacturing Technology

Figure 4 shows core sources by Bradford's Law.

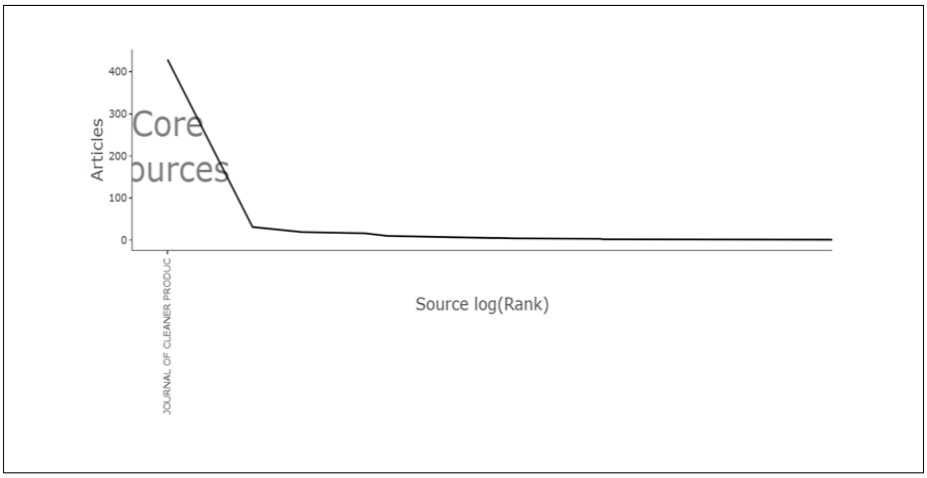

FIGURE 4. Core sources by Bradford's Law

Note: compiled by authors based on Bibliometrix Biblioshiny tool

Management is in second place. The top five relevant sources included the International Journal of Production Research, the International Journal of Production Economics, Business Strategy, and the Environment.

The geographical influence of research on responsible production is reflected in Figure 5 and Figure 6. Next in Figure 5 there is data on citations by country.

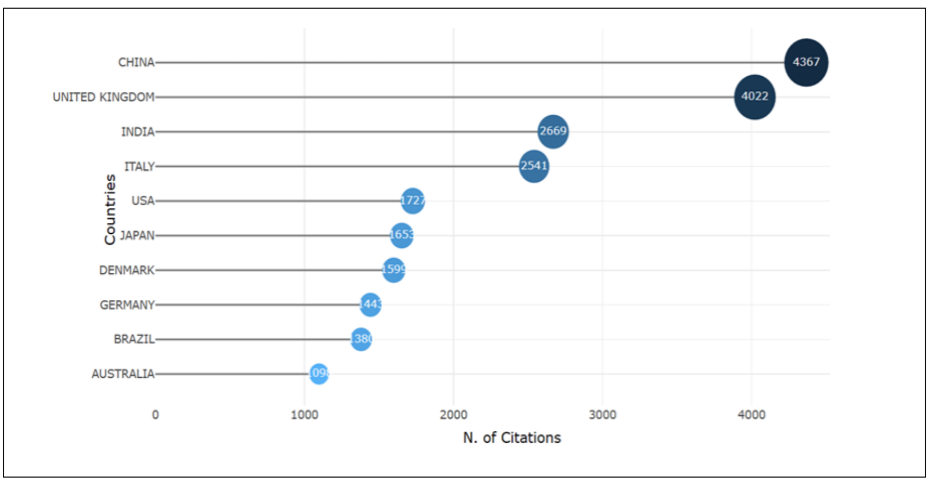

FIGURE 5. Total number of citations per country

Note: compiled by authors based on Bibliometrix Biblioshiny tool

Geographical influence of research

These figures reflect the countries with the most citations by two indicators: the total number of citations and the average number of citations per publication. Regarding total citations, China and the UK are the leading countries. Each of these countries individually accounts for about 4 thousand citations. India and Italy are next in terms of the total number of citations: the studies of these countries have been cited about 2,500 times in total. This may indicate that research on responsible production is actively being conducted in the countries mentioned above, and these studies contribute to the analyzed area. However, total citations may not adequately reflect the impact of published research.

Next in Figure 6 there is data on average citations by country.

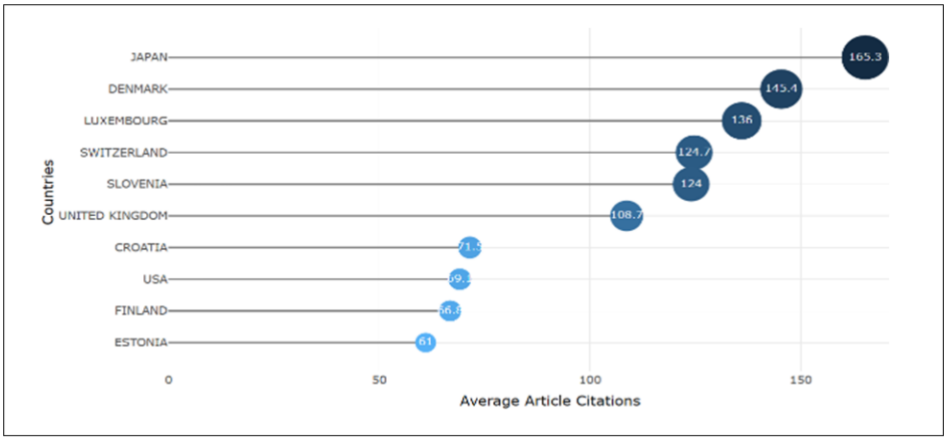

FIGURE 6. Average article citations per country

Note: compiled by authors based on Bibliometrix Biblioshiny tool

The indicator of the average number of citations per publication considers the number of publications and, therefore, can reflect the impact of published research more adequately. In terms of the average number of citations per publication, other countries are already leading, particularly Japan, Denmark, Luxembourg, Switzerland, Slovenia, and the UK. In these countries, on average, one publication was cited more than 100 times, indicating a relatively high impact of research on responsible production in these countries.

Next in Figure 7 there is data on Most relevant affiliations.

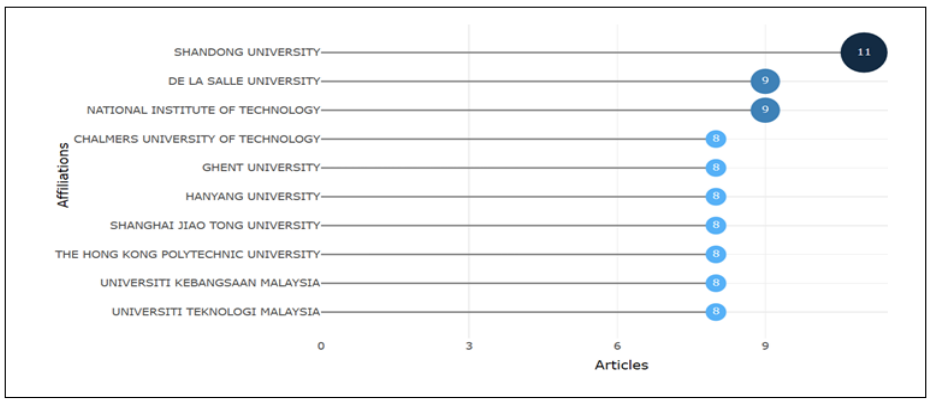

FIGURE 7. Most relevant affiliations

Note: compiled by authors based on Bibliometrix Biblioshiny tool

As for the most relevant affiliations, Shandong University has the most significant number of publications on responsible production; the second and third places are occupied by De La Salle University and the National Institute of Technology (Figure 7).

The intensity of the international collaboration is reflected in Figure 8. The most intensive collaboration takes place in Australia. There, out of 40 publications, 25 studies were conducted jointly with scientists from other countries. In Belgium, 11 out of 15 studies cooperated with foreign scientists. China and Canada performed half of their research jointly with foreign scientists.

The least intensive international collaboration is observed in the United Kingdom: out of 37 publications, only three were conducted jointly with foreign scientists. Out of 25 studies on responsible production in the USA, only two were conducted jointly with foreign scientists. The situation is similar in Spain, Sweden, Malaysia, the Netherlands, and Turkey.

Figure 8 presents the number of documents by country and type of collaboration.

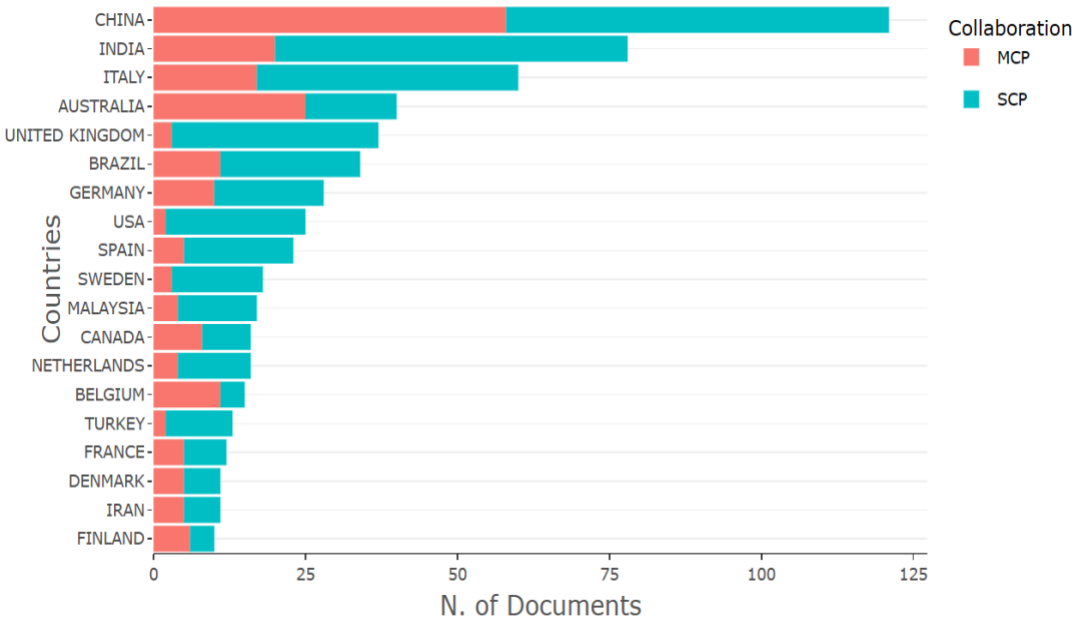

FIGURE 8. Corresponding author's country

Note: compiled by authors based on Bibliometrix Biblioshiny tool

Figure 9 reflects trend topics in the field of responsible production for the period from 2008 to 2024. Topics such as agriculture, production, and environment remain relevant throughout the analyzed period, indicating these topics' fundamental nature. The key ones were the terms sustainable production and sustainability, occurring 171 and 111 times, respectively, in the analyzed collection. The circular economy, as a concept closely related to responsible production, has also become one of the trend topics. Life cycle assessment, sustainable consumption, supply chain management are the topics that were relevant up to 2021. Certification as an integral mechanism for ensuring responsible production was widespread between 2011 and 2018. Industry 4.0, renewable energy, additive manufacturing – all these topics are gaining relevance since 2022.

Figure 9 describes trend of research terms over time (2008-2024).

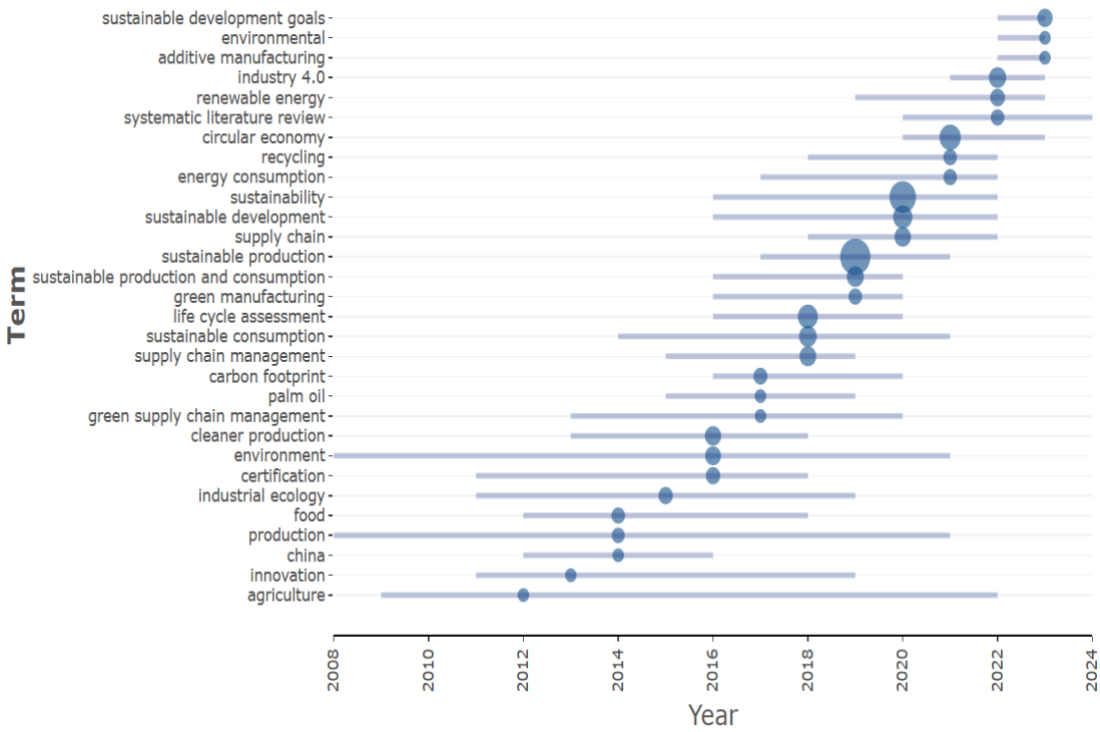

FIGURE 9. Trend topics

Note: compiled by authors based on Bibliometrix Biblioshiny tool

Three fields plot

A three-field plot reflects the interrelation of paper elements (Zhidebekkyzy et al., 2022). For example, figure 10 displays the specialization of countries and journals in exploring a definite area of responsible production.

The bulk of research outputs identified in the study originates from countries such as China, Italy, India, and the United Kingdom, highlighting their active participation in this domain. Brazil and Malaysia also emerge as significant contributors, especially among the developing nations, showcasing their growing involvement in sustainability research.

Delving deeper into the attribute interconnections, China exhibits a remarkably broad and integrated approach to the study of responsible production. This nation engages comprehensively in the field, from exploring the foundational principles of sustainable production to investigating its practical implications and technologies, including life cycle assessment, Industry 4.0 applications, and supply chain management intricacies.

In contrast, Germany appears more selective, focusing predominantly on advanced technological aspects rather than the broader scope of sustainable production. The country shows a particular interest in Industry 4.0, reflecting its advanced industrial base and technological prowess.

Italy, meanwhile, has carved a niche in exploring the life cycle assessment aspect of responsible production, reflecting its commitment to detailed environmental impact studies. India, similar to Germany, shows a strong inclination towards integrating Industry 4.0 technologies within the framework of responsible production, indicating a strategic focus on modernizing its manufacturing sectors.

Furthermore, supply chain management within the context of responsible production

attracts substantial scholarly attention, particularly from researchers in Australia, the UK, the USA, and Italy. This focus underscores the global importance of optimizing supply chain operations to enhance sustainability across industries.

The Journal of Cleaner Production stands out as a premier publication venue, leading in disseminating diverse research encompassing all dimensions of responsible production. This journal's prominence underscores its pivotal role in shaping discourse and advancing research in the field of sustainability and responsible production practices.

Figure 10 describes the mapping of research contributions by country, topic, and journal.

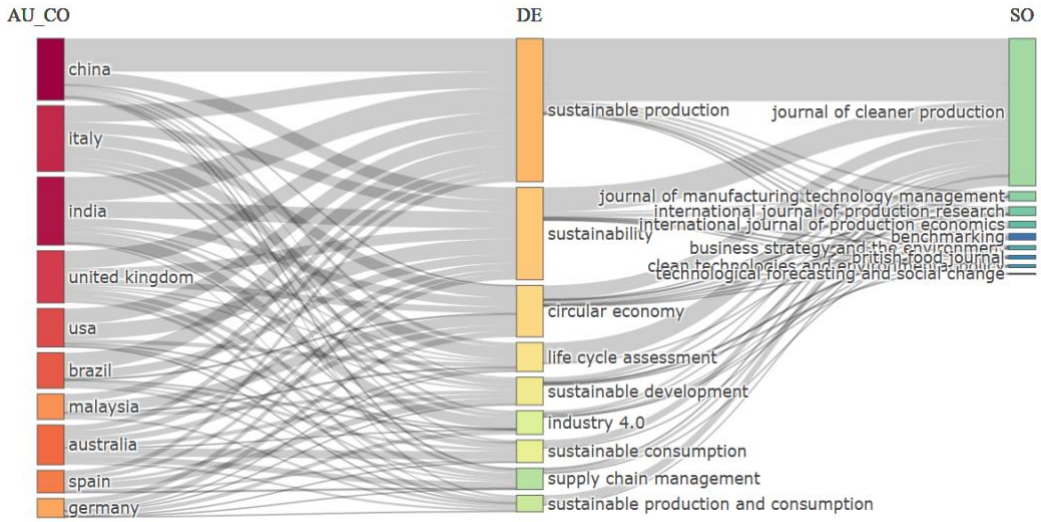

FIGURE 10. Three-fields plot

Note: compiled by authors based on Bibliometrix Biblioshiny tool

Co-occurrence Network

R-package Bibliometrix with the Biblioshiny tool was applied to build a co-occurrence network. The author's keywords with Walktrap clustering algorithm were used.

The basic, central, and largest cluster is "Sustainable production". There are four critical clusters on the co-occurrence network (see Figure 11).

FIGURE 11. Co-occurrence Network

Note: Compiled by authors based on Bibliometrix Biblioshiny tool

The second largest cluster, closely related to the "Sustainable production" node, is the circular economy cluster. The concept of CE is essential for achieving responsible production. There is a close relationship between CE cluster and Industry 4.0 which lets assume the critical role of Industry 4.0 tools in applying CE principles. Barriers, waste management, food waste are located within a cluster of CE, which indicates an active study of barriers to CE and special scientific attention to food waste management.

The next cluster is the life cycle assessment. Keywords such as sustainable production and consumption, climate change, environmental impact, and environmental sustainability are inside the cluster. This cluster is most likely studying how to achieve sustainable production and consumption, environmental sustainability, and prevent climate change with the help of the life cycle assessment concept.

Sustainable development has been allocated to a separate cluster. This cluster focuses on corporate social responsibility, social responsibility, and responsible consumption. Whereas previous clusters focused on the environmental aspects of responsible production, the sustainable development cluster focused on the aspects of social responsibility.

Thematic map

Figure 12 shows the current state-of-the-art of responsible production research.

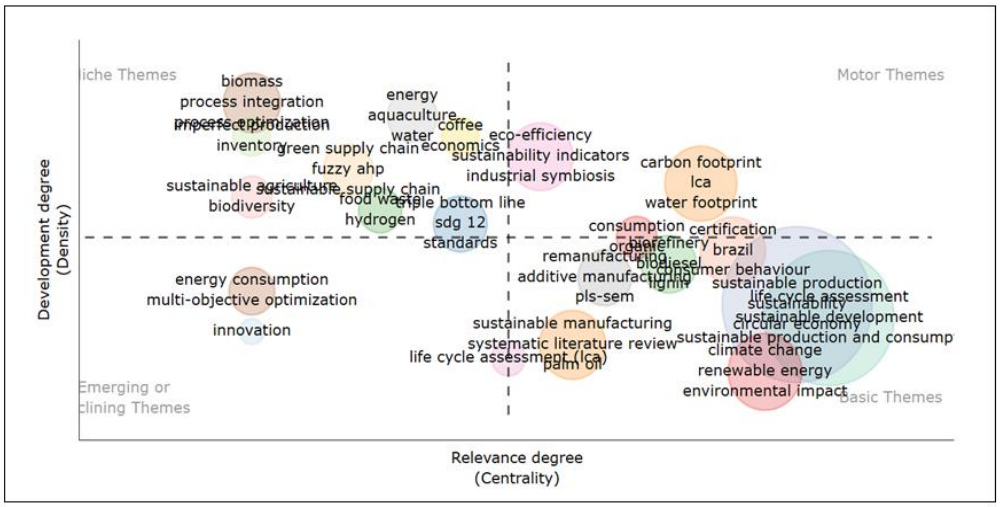

FIGURE 12. Thematic map

Note: compiled by authors based on Bibliometrix Biblioshiny tool

The author's keywords were applied to reflect the thematic map, and a minimum cluster frequency of 5 points was set. Besides, a total data sample of 858 papers was taken for the thematic mapping.

The map has two dimensions: centrality (x-axis) and density (y-axis). Centrality refers to how important a particular theme is, while density refers to the development of the theme. The 2×2 matrix in the thematic map yields four quadrants, where the size of the bubble refers to the occurrence of the keywords (Madsen et al., 2023).

In the upper right quadrant, we find the motor themes that are the most discussed topics in the field. About responsible production research field, motor themes are carbon footprint, life cycle analysis and water footprint. Inside the "carbon footprint" cluster are two other keywords: crop production and wine. At the stage of transition to the category of motor themes are eco-efficiency, sustainability indicators, and industrial symbiosis, as well as product design and

sustainable consumption and production.

In the lower right quadrant, we find the themes considered basic and transversal, with low levels of development but high levels of centrality and relevancy to the responsible production literature. According to the map, the largest primary cluster is "sustainable production". It consists of such keywords as sustainability, circular economy, sustainable consumption, industry 4.0, supply chain management, cleaner production, energy efficiency, optimization, and environmental performance. The second largest basic cluster is the "life cycle assessment" cluster, which, among other things, contains keywords such as "waste management" and "industrial ecology". Among other basic themes are climate change, renewable energy, sustainable manufacturing, remanufacturing, and biorefinery. Keywords such as certification, Brazil, consumer behaviour, consumption are likely to become motor themes. Life cycle assessment is going to turn into a central topic.

In the lower left quadrant, the emerging or declining themes are situated. These are energy consumption, multi-objective optimization, and innovation.

The upper left quadrant consists of niche themes, which are well-developed but isolated (niche) or highly specialized themes. Niche clusters include biomass, process integration, process optimization, and process simulation. Among niche themes are energy, green supply chain, sustainable agriculture, food waste, coffee, triple bottom line, and standards.

Thematic evolution

Thematic evolution reveals changes in theme temporal development (see Figure 13).

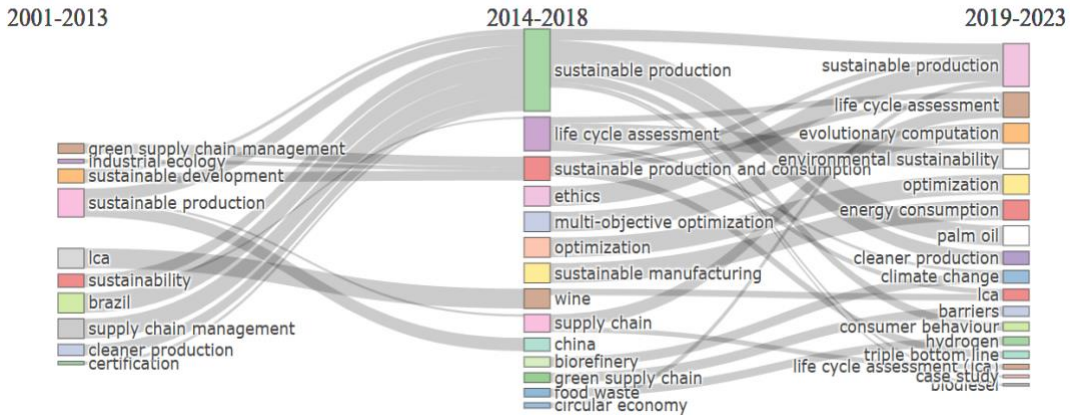

FIGURE 13. Thematic evolution

Note: compiled by authors based on Bibliometrix Biblioshiny tool

The period from 2001 to 2023 was taken to form the thematic evolution. The period from 1987 to 2000 was removed because, during this period, the number of publications was insignificant. The year 2024 was deleted because this year began recently, and the picture of publication activity is incomplete.

The dataset was divided into three time periods. The degree of publication activity was chosen as a key criterion for defining time slices. The first time slice (2001-2013) is characterized by a smooth and barely noticeable increase in publication activity. The period from 2014 to 2023 is characterized by explosive growth in publication activity (Figure 1), and it was decided that this period should be divided into two equal time intervals.

The author's keywords that appeared at a minimum seven times (min Freq.) per subperiod were reflected in the formed three thematic maps (Figures 13-15). In each thematic map, the y-axis evaluates the density, and the x-axis evaluates the centrality of the defined themes. The spheres' size corresponds

to the keywords' cumulative frequency (Schöggl et al., 2020).

From 2001 to 2013, the most relevant keywords were sustainable production, supply chain management, life cycle assessment, and Brazil. In the period 2014 to 2018, the topic of sustainable production was split into three topics: sustainable production, China, and supply chain. During this period, particular attention was given to supply chain management, and China's role in the issue of responsible production was highlighted separately. LCA has moved to wine, reflecting the importance of production management at every stage of the product lifecycle using the example of winemaking.

Brazil and supply chain management were united in a theme of "sustainable production," which suggests that in 2014-2018, supply chain management issues began to be considered within the framework of the responsible production concept, and Brazil became more active in studying responsible production issues.

Besides cleaner production, certification were also incorporated in sustainable production.

From 2014 to 2018, the key topics continued to be sustainable production, life cycle assessment.

The topic "sustainable production and consumption" has appeared among the key topics during this period. This fact may indicate an awareness during this period of the close relationship between responsible production and responsible consumption and the importance of the consumer's role in achieving responsible production principles.

Other essential topics from 2014 to 2018 were ethics, multi-objective optimization, sustainable manufacturing, and wine.

From 2019 to 2023, key research areas remain sustainable production, life cycle assessment. New areas such as evolutionary computation, environmental sustainability, optimization, energy consumption, and palm oil are added. Besides, life cycle assessment was included in environmental sustainability, which indicates the increasing role of the life cycle assessment concept in achieving environmental sustainability. Sustainable manufacturing strengthened its connection with energy consumption, which is reflected in the transition of sustainable manufacturing to the field of energy consumption. The cleaner production concept has again detached itself into an independent field of research after merging with the sustainable production concept in 2014-2018. LCA and biorefinery were incorporated into climate change, and the green supply chain moved into barriers. Such a thematic evolution suggests an increase in scientific interest in studying the impact of LCA and biorefinery on climate change, as well as an increase in the relevance of studying barriers to achieving a green supply chain. Consumer behavior has emerged from sustainable production into a separate area, indicating the formation of a self-standing scientific direction studying consumer behavior in the context of responsible production. In addition, food waste has been transformed into hydrogen, indicating the relevance of studying hydrogen production from food waste.

Responsible production research between 2001 and 2013

Next, in Figure 14 there is provided data on responsible production between 2001 and 2013.

Sustainable development and waste management are this period's basic and fundamental topics. The two most significant motor clusters, characterized by both high relevance and high development, are sustainable production, which includes sustainable consumption and food, and sustainability, which includes environment, agriculture, and life cycle assessment.

From this, it can be concluded that in the period 2001-2013, the scientific community was intensively involved in problems of responsible production and consumption with an emphasis on the food industry and agriculture, as well as mainly considering environmental concerns. Other reasonably large clusters in this period are certification and industrial ecology.

They are both closely related to the sustainable production and sustainability clusters. Another small-sized motor cluster is green supply chain management. The eco-efficiency cluster is characterized by low relevance but high development, which made it possible to classify it as a niche topic. This suggests that the issues of eco-efficiency indicators and their assessment have already been studied by scientists during this period but were not so relevant. The clusters' cleaner production, innovation, and LCA belong to emerging themes (Figure 14).

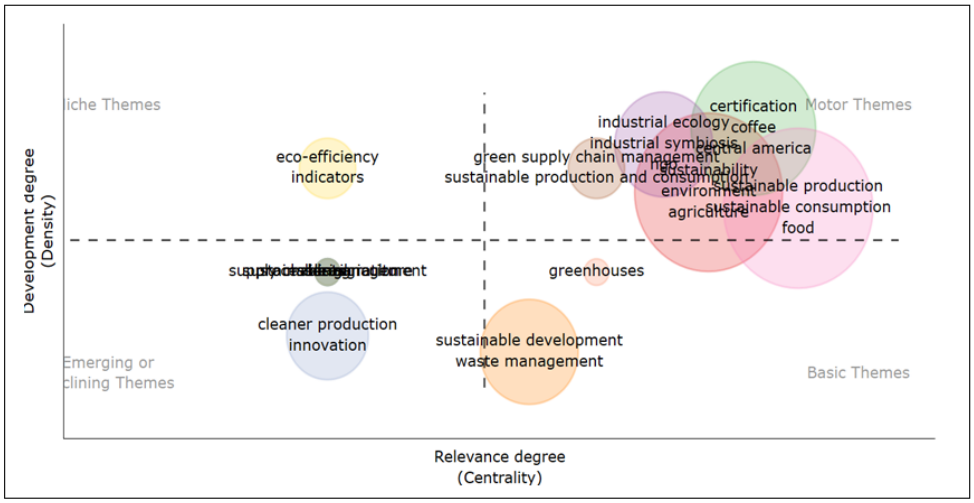

FIGURE 14. Thematic map of responsible production research between 2001 and 2013

Note: compiled by authors based on Bibliometrix Biblioshiny tool

Responsible production research between 2014 and 2018

During this period, the keywords sustainable production and sustainable consumption merged and formed a single cluster of sustainable production and consumption. Such a merger indicates that these two concepts began to be studied in an inextricable connection. However, this combined cluster has moved from the category of motor topics to the category of basic ones, maintaining high relevance but losing its sophistication. This may be due to the emergence of new topics and concepts within the vast field of responsible production. Within the cluster of sustainable production and consumption, the keyword corporate social responsibility appeared, indicating that corporate social responsibility issues began to be considered within the framework of the responsible production concept. In addition, energy efficiency is also located inside the sustainable production and consumption cluster. That is, during this period, special attention was paid to energy efficiency issues as a tool for achieving the principles of responsible production.

The next largest primary cluster from 2014 to 2018 is the life cycle assessment cluster, which includes keywords such as carbon footprint, climate change, environmental sustainability, and environmental impact. The remaining basic clusters are biorefinery, collaborative consumption, and optimization.

As for motor topics, the largest motor cluster is the cluster of sustainable production, where sustainability and supply chain management were included. Compared to the previous period, supply chain management topic has become more relevant, by increasing the number of occurrences from 2 to 11 and becoming part of the sustainable production cluster. The other three motor clusters are supply chain, circular economy, and wine. The

wine cluster contains keywords such as ecological footprint, land use, water footprint, and willingness to pay. The combination of such keywords in the same cluster indicates increased scientific interest in studying ecological and water footprint in the production processes. In addition, land use, as well as the willingness to pay a premium when buying products manufactured according to responsible production principles, are also gaining relevance. The food waste management cluster belongs to niche topics that are not yet very relevant but are actively being studied by scientists. This cluster contains keywords such as food waste, food surplus, waste prevention. Another niche topic is the green supply chain. Emerging or declining topics include sustainability indicators, stability, and China (Figure 15).

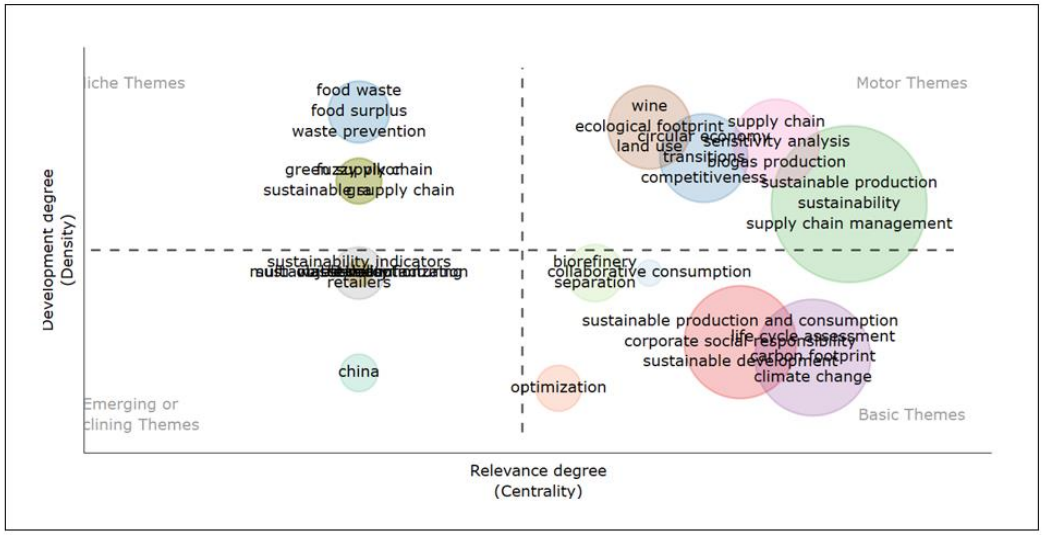

FIGURE 15. Thematic map of responsible production research between 2014 and 2018

Note: compiled by authors based on Bibliometrix Biblioshiny tool

Responsible production research between 2019 and 2023

Next in Figure 16 there is provided data on responsible production between 2019 and 2023. The largest basic cluster of this period is the sustainable production cluster. From 2019 to 2023, the concepts of responsible consumption and corporate social responsibility continue to be considered within the framework of the responsible production concept. This fact indicates that the significant role of consumers in achieving responsible production continues to be recognized, and corporate social responsibility has been firmly integrated into the concept of responsible production.

The second largest primary cluster is the additive manufacturing cluster, which includes such keywords as environmental performance and remanufacturing. Other primary clusters were optimization, life cycle assessment, and biodiesel.

Life cycle assessment has become more actively studied, as evidenced by the transition of the corresponding cluster from the basic category to the motor one. The life cycle assessment cluster contains keywords such as supply chain, energy efficiency, manufacturing, and blockchain. It can be assumed that the relationship between the life cycle and the supply chain is becoming increasingly relevant, as well as energy efficiency at each stage of the life cycle, the use of blockchain technologies in evaluating and analyzing the product life cycle.

The second largest motor cluster is the climate change cluster. The content of this cluster indicates the significant role of renewable energy, biomass, biorefinery in climate change issues. The third largest motor cluster is barriers, including India's green supply chain. The remaining motor clusters are hydrogen, which is an imperfect production. The hydrogen cluster is moving from niche topics to motor ones, reflecting the growing importance of studying the issues of obtaining hydrogen and biogas from food waste.

The life cycle assessment cluster, which includes keywords such as carbon footprint and water footprint, is at the stage of transition from niche topics to motor ones. Thus, there is an increase in the relevance of carbon footprint and water footprint research within the product lifecycle. Another niche topic is efficiency. Emerging themes include triple bottom line, case study, and cleaner production (Figure 16).

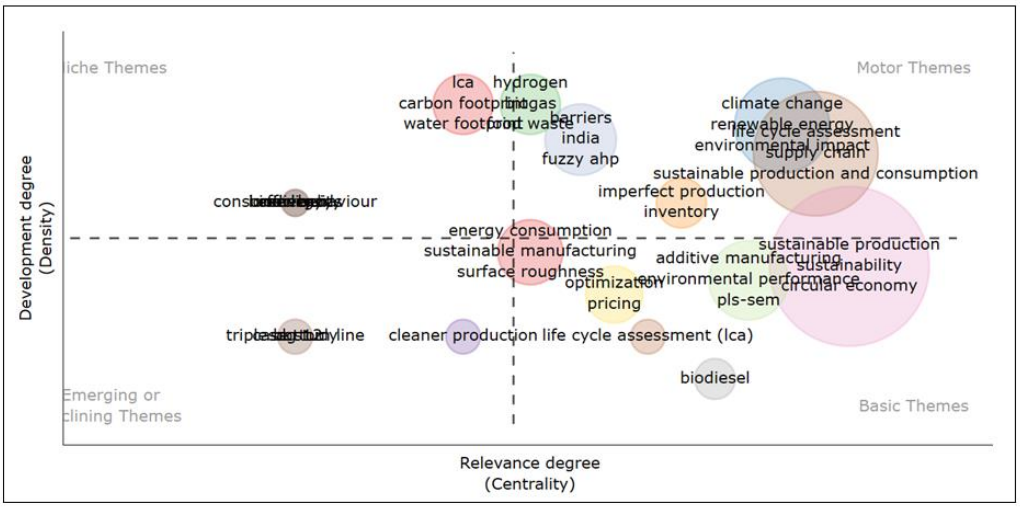

FIGURE 16. Thematic map of responsible production research between 2019 and 2023

Note: compiled by authors based on Bibliometrix Biblioshiny tool

Content analysis results

A qualitative content analysis was additionally conducted to complement RP research's previous quantitative bibliographic analysis. The period from 2014 to 2024 was taken for content analysis. This implied defining the 15 most influential papers from the RP literature, i.e., those with the highest total citation score. The list of these 15 papers is represented in Annex 1.

The most discussed topic, according to the content analysis results, was the area of sustainable supply chains. Yildiz and Sezen (2019) evaluated the effects of green supply chain management practices on sustainability performance in Turkish manufacturing firms. The authors concluded that all GSCM dimensions are related to at least one of the performance dimensions except for green purchasing. Awasthi et al. (2018) presented an integrated framework for sustainable global supplier selection that considers sustainability risks from sub-suppliers.

Consumer behaviour in the context of responsible production is the second most discussed research area. Gullstrandedbring et al. (2016) examined consumer attitudes, motivations, and barriers relating to the three alternative consumption models, with particular emphasis on furnishing products. The main motivation for the consumption of second-hand products is economic. The biggest obstacle for people buying second-hand products for use in the home is that they are seen as unsanitary. Materialism and the desire

to own are severe barriers to the access-based consumption model.

The third most relevant topic is the impact of Industry 4.0 on implementing responsible production principles. Bag et al. (2021) identified thirty-five resources that are essential for the adoption of Industry 4.0. Also, the authors concluded that I4.0 adoption has a positive relationship with sustainable production. Nascimento et al. (2019) proposed a circular business model for recycling waste and delivering new products, significantly reducing resource consumption and optimizing natural resources by integrating web technologies, reverse logistics, and AM.

Other important topics were the sustainable management of food surplus and food waste and the role of life cycle assessment in supporting sustainable food systems. Papargyropoulou et al. (2014) propose the food waste hierarchy as a framework to identify and prioritize the options for minimizing and managing food surplus and waste throughout the food supply chain. Bocken et al. (2014) identified a wide range of examples of mechanisms and solutions that can contribute to business model innovation for sustainability. Annex 2 reflects main information on top 15 works on responsible production research.

5. CONCLUSIONS

This study sought to identify the current focus of scientific interest in responsible production research as well as possible future research questions on this topic. A mixed-methods approach was applied to achieve the research aim, combining systematic bibliographic analysis and content analysis. According to the review results, scientific activity on RP research has increased sharply since 2013. The core publication of responsible production is the Journal of Cleaner Production.

According to the results of the co-occurrence network analysis and thematic mapping, the role of supply chain management in achieving responsible production principles is significant. Also, at the moment, the environmental aspect of RP, in particular environmental management and environmental performance, is of the greatest scientific interest. The role of consumers in achieving the goals of the responsible production concept is also important. Among all types of resources, the issues of efficient use of energy resources are at the forefront. The issues of responsible production in the food industries, in particular, the issues of food waste management, are of particular relevance. The study of the impact of industry 4.0 tools on achieving responsible production principles is also the focus of scholars' attention.

Reducing the negative effects of production processes, waste management at each stage of the product life cycle, as well as achieving environmental sustainability within the framework of the life cycle assessment concept are also relevant areas of research. The issues of water footprint and carbon footprint throughout the product life cycle, in particular, carbon footprint in crop and wine production, are characterized by special relevance and arouse active scientific interest. Although small in size, the concepts of corporate social responsibility and social responsibility formed an independent cluster. Social responsibility issues are also an object of current scientific interest, although not yet as active as environmental responsibility issues.

Thematic mapping has shown that interest in topics such as sustainability indicators and industrial symbiosis, as well as product design, is steadily growing. There is an increase in the relevance of obtaining hydrogen and biogas from food waste.

Content analysis of the most influential papers in the field of RP generated results that align with descriptive analysis. In particular, according to the content analysis results, sustainable supply chains were the topic discussed the most. The impact of green supply chain management practices on sustainability performance and sustainable global supplier selection is among the most relevant topics.

According to the content analysis results, consumer behaviour in the context of responsible production is the second most

discussed research area. Consumer attitudes, motivations, and barriers relating to responsible consumption models are being actively studied. The impact of Industry 4.0 on the implementation of responsible production principles is another area of research that has been actively studied, according to the results of content analysis, which is consistent with the results of descriptive analysis. Responsible business models and sustainable management of food surplus and food waste are also the focus of scientific interest. Future research directions derived from content analysis are reflected in Annex 3.

As for practical implications, the conclusions of this study may be useful for academic community representatives involved in the study of responsible production issues, as well as for government bodies and the business environment involved in the development and implementation of responsible production practices.

AUTHOR CONTRIBUTION

Writing – original draft: Aknur Zhidebekkyzy, Dinara T.Kalmakova
Conceptualization: Aknur Zhidebekkyzy, Dinara T.Kalmakova, Anna Kotaskova
Formal analysis and investigation: Dinara T.Kalmakova
Funding acquisition and research administration: Aknur Zhidebekkyzy
Development of research methodology: Aknur Zhidebekkyzy, Dinara T.Kalmakova
Resources: Aknur Zhidebekkyzy, Dinara T.Kalmakova, Anna Kotaskova
Software and supervisions: Aknur Zhidebekkyzy, Dinara T.Kalmakova
Data collection, analysis and interpretation: Dinara T.Kalmakova
Visualization: Dinara T.Kalmakova.
Writing review and editing research: Aknur Zhidebekkyzy, Dinara T.Kalmakova, Anna Kotaskova

ANNEX 1

Papers selected for content analysis

No.	Paper	Total Citations
1	Bocken N, 2014	2144
2	Papargyropoulou E, 2014	961
3	Govindan K, 2018	738
4	Nascimento D, 2019	499
5	Rajeev A, 2017	438
6	Awasthi A, 2018	402
7	Notarnicola B, 2017	401
8	Glover JL, 2014	313
9	Yildiz Çankaya S, 2019	310
10	Esfahbodi A, 2016	273
11	Schäufele I, 2017	271
12	Franco MA, 2017	260

13	Gullstrand Edbring E, 2016	245
14	Akenji L, 2014	232
15	Bag S, 2021	205

ANNEX 2

Top 15 works on responsible production research selected for content analysis

No.	Article (author and reference)	Article type	Research Topic/ question	Main findings	Dep. Var.	Indep. Var.	Methods adopted
1	Bocken N, 2014	review	How can we encourage corporate innovation that significantly changes the way companies operate to ensure greater sustainability?	The paper introduces sustainable business model archetypes to categorize mechanisms and solutions for sustainability in business models	N/A	N/A	a systematic review approach
2	Papargyropoulou E, 2014	empirical	How to manage food surplus and food waste more sustainably?	The main findings include the proposal of a food waste hierarchy to challenge current waste management approaches	N/A	N/A	Qualitative data analysis through interviews with specialists
3	Gullstrand Edbring E, 2016	empirical	What are the attitudes of young consumers to the three models of consumption? What are the underlying motivations and obstacles relating to changing young consumers' consumption behaviour towards alternative consumption models?	Attitudes towards buying second-hand products are primarily driven by practical and economic reasons, with a lesser emphasis on environmental concerns.	N/A	N/A	interviews with experts and an online survey of consumers
4	Govindan K, 2018	review	What are the drivers, practices, and barriers towards the circular economy in a supply chain?	The key conclusions of the paper include the significance of government engagement in implementing the circular economy in supply chains, the challenges organizations face in addressing technological issues, and the need for awareness and education in society and among consumers.	N/A	N/A	a systematic review approach
5	Akenji L, 2014	Theoretical paper	What is the effectiveness of green consumerism	- Green consumerism is not an effective driver of sustainable	N/A	N/A	The methodology involves

			in driving society towards sustainable consumption patterns?	consumption and may distract from urgent structural changes needed for sustainable development.			clarifying differences between green consumerism and sustainable consumption
6	Bag S, 2021	empirical	What are the required resources for I4.0 implementation in the context of sustainable production and Circular Economy? Can we establish a relationship between I4.0 adoption, sustainable manufacturing and CE capabilities?	I4.0 adoption have a positive relationship with sustainable production	Sustainable production, Circular economy capabilities	production systems, human resources, project management, management leadership, green logistics, green design	exploratory factor analysis (EFA), testing using PLS-SEM
7	Franco MA, 2017	empirical	What factors hinder firms' ability to go fully circular and how do these factors interact to move firms and industries towards a circular production system?	the speed and quantity of Cradle to Cradle (C2C) products manufactured and available to customers and take-back partners depend on the availability of basic materials and component parts	N/A	N/A	qualitative research through multiple case studies
8	Glover JL, 2014	empirical	What are the factors affecting the acceptance of sustainable practices and energy reduction strategies in the dairy supply chain?	The major findings of the study include the emphasis on cost reduction and profit maximization as dominant logics in the dairy supply chain, the significant power of supermarkets in exerting pressure on sustainable practices	Sustainable practices implemented, level of energy efficiency	Stakeholders across the dairy supply chain, Sustainable practices in the dairy supply chain	conducting 70 semi-structured telephone interviews with stakeholders across the dairy supply chain
9	Yildiz Çankaya S, 2019	empirical	What is the effect of different dimensions of green supply chain management on economic, environmental, and social performance in the context of corporate sustainability?	The main findings emphasize the significance of GSCM in enhancing sustainability performance	Environmental performance Economic	Green purchasing, green manufacturing, green distribution, green packaging, green marketing	a plant-level survey, using cross-sectional face-to-face and e-mail surveys

					performance Social performance		
10	Schäufele I, 2017	review	How do consumers' values, beliefs, and attitudes influence their purchase behavior towards wine with sustainability characteristics	The paper emphasizes the complexity of consumers' wine choices, the importance of sustainability cues as credence attributes	N/A	N/A	an online literature search
11	Nascimento D, 2019	Review and empirical	How can Industry 4.0 technologies be integrated into circular economy practices to reuse electronic waste and scrap materials?	- The recommendation of a circular model to reuse scrap electronic devices - Positive influence on business sustainability by reinserting waste into the supply chain	Impact of reusing materials on resource spending and environmental effects	- Industry 4.0 technologies -Additive manufacturing (AM) -Smart production systems	a qualitative research method literature review, interviews and focus groups
12	Rajeev A, 2017	Review	Analyze the progress of sustainability research within supply chain management literature	The study emphasizes a lack of research focusing on all three dimensions of sustainability in supply chain management	N/A	N/A	Systematic literature review
13	Awasthi A, 2018	empirical	RQ1: What is the best approach to evaluate supplier sustainability? RQ2: Which sustainability criteria need to be considered for evaluating sustainable suppliers?	- Economic criteria had the highest weight, while global risk had the least weight among the sustainability criteria considered.	Sustainability performance and risks of suppliers and sub-suppliers in the	- Time - Space - Density - Mass - Fluid flow rate	fuzzy AHP and VIKOR, case study, and fuzzy AHP.

					global supply chain		
14	Notarnicola B, 2017	empirical	What are the issues and research preferences for life cycle assessment in supporting sustainable food supply chains?	- Life cycle thinking is crucial for sustainable food supply chains. - Improving food production and consumption systems is essential for sustainable development.	N/A	N/A	discussing challenges and research priorities including dedicated modeling approaches
15	Esfahbodi A, 2016	empirical	Does the adoption of SSCM practices result in a higher level of environmental performance and improved cost performance in emerging economies?	- Implementation of SSCM activities leads to higher environmental performance but not improved cost performance in emerging economies	Environmental Performance, Cost Performance	- Sustainable procurement - Sustainable distribution - Sustainable design - Investment recovery	linear regression analysis, a one-way ANOVA

ANNEX 3

Selected opportunities for future research on responsible production

Research areas	Suggestions and questions for future research
Case studies in responsible production research area	What are the cases of best practices, business models for the introduction of responsible production on the example of companies in various industries?
	What are the features of the introduction of responsible production on the example of companies from countries with different levels of per capita income?
Supply chain management in the context of responsible production	How do organizational resources, organizational structure, and corporate culture affect the performance of implementing responsible production?
	What are sustainable supply chain management practices, issues, and models on the most polluting industries across the world?
	There is a necessity to include more industry specific studies, as the responsible production needs and performance of all the industries are not equivalent.
	There is a need for more studies to develop better scales for measuring the social impact of various supply chains
	What are the effects of green supply chain management practices on sustainability performance in non-manufacturing organizations like wholesalers or retailers?
	Does the application of SSCM activities lead to a higher level of environmental performance and eventually result in enhanced cost performance in emerging economies, in SMEs, in service sectors?

Consumer behaviour in the context of responsible production	Compare attitudes, motives and barriers to responsible consumption patterns in developed and developing countries, countries with different income levels, in different regions of the same country, among representatives of generations X,Y, Z
Industry 4.0 and responsible production	To evaluate and compare the impact of industry 4.0 on the implementation success of responsible production principles in various industries
Responsible business models	What is the role of social business model innovations in sustainability? What is the impact of social business model innovations on corporate economic and financial performance?

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Interlinkages between Urbanization and Regional Sustainable Development

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ABSTRACT

The article examines the impact mechanisms of urbanization on the sustainable development of territories, as evidenced by 85 regions of the Russian Federation. An abstract logical approach was used to summarize the key provisions of the sustainable development concept and evaluate the relevance of specific indicators. Econometric and statistical methods were applied for statistical data collection and analysis to assess the considered factors. Hypotheses and assumptions were employed to assess the investigated factors and perform regression analysis through economic and mathematical modeling methods. The presence of a moderate positive relationship between the level of regional sustainable development and the share of urban population and the total population in the region was revealed. It has been assumed that the indices of regional sustainable development should encompass indicators characterizing rural areas to estimate urban-rural development proportions. Greater emphasis should be put on the effective coordination of urban and rural development and the assessment of economic, institutional, infrastructural, environmental, and other conditions at the level of rural local communities. The latter have scarce opportunities for sustainable socio-economic development due to remoteness from urban centers (depopulation, aging population, poverty, unemployment, low quality of life, digital divide, etc.). This is urgent for the Russian Federation's sustainable development, considering its spatial extent and territorial heterogeneity.

KEYWORDS: Urbanization, Sustainable Development, Economic Development, Regions, Spatial Differences, Spatial Polarization, Environmental Sustainability, Russia

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1. INTRODUCTION

The Russian Federation is characterized by the crucial divergence of its socio-economic space due to the internal territory heterogeneity, the peculiarities of population and resource distribution, and the sectoral specifics of the economy. Notably, the enhanced spatial polarization is evidenced in the dramatic growth of large cities (Sukhinin et al., 2022). Undoubtedly, being specific to modernity, urbanization processes are a powerful tool for sustainable development, provided these are appropriately planned and effectively managed. Today, more than 50% of the world's population lives in urban areas, expected to increase to nearly 70% by 2050. Projections indicate that urbanization combined with the overall growth of the world's population could add another 2.6 billion people to urban areas and reach 6.3 billion (67%) (United Nations, 1987).

Urban areas occupy almost all the population growth, captivating a significant part of rural residents located remotely from resource attraction venues, often deprived of favorable working conditions and lacking opportunities to choose suitable jobs. A similar case concerns the possibilities of using social infrastructure, the accessibility and quality of the transport network, the housing, etc. Eventually, rural areas will be heavily restricted in their ability to respond to current challenges and threats (depopulation, poverty, unemployment, aging population, digital divide, etc.), which is especially relevant for the Russian Federation, given its scale. As a result, population migration becomes a critical negative factor in shaping the development direction for rural settlements and small and medium-sized cities.

Because of a long-lasting demographic decline, the Russian Federation ranks ninth by population with 146.2 million inhabitants in 2024, causing compression of economic space and an increased polarization. This is how the central growth poles and peripheries are formed, and the differences reach enormous proportions (3.5 times difference by the average income of the population per capita between 10% top and lagging regions). Unfortunately, it does not appear easy to overcome such trends despite the government policy focusing on ensuring openness, safety, resilience, and sustainability of cities and human settlements (United Nations Sustainable Development Goal 11). These stem from the lack of a systematic approach in terms of sustainable development goals (SDGs).

The sustainable development agenda is one of the most important and addressed issues by government authorities and academicians. The increased anthropogenic effects on the environment inevitably lead to a decrease in the population's level and quality of life and a deterioration of business conditions for economic entities. In recent decades, in conditions of instability of the external environment and geo-political and geo-economic turbulence, the sustainable development of the Russian Federation and the constituent entities has gained increased attention from the state leadership. According to the Decree of the President of the Russian Federation dated February 04, 1994, No. 236 On the State Strategy of the Russian Federation for Environmental Protection and Sustainable Development, and the Decree of the President of the Russian Federation dated April 01, 1996, No. 440 On the Concept for the Transition of the Russian Federation to Sustainable Development, the transition to sustainable development should provide a balanced solution to socio-economic development and environmental preservation, meeting the needs of present and future generations.

Furthermore, some founding documents acting as a regulatory framework for sustainable development were approved (e.g., decrees, laws, and strategies regulating socio-economic development in the context of limiting greenhouse gas emissions, etc.). In 2017, several critical documents aimed at creating sustainable development were drafted: the Instructions of the President of the Russian Federation following a State Council meeting On the Environmental Development of the

Russian Federation for the Benefit of Future Generations (dated January 24, 2017); the Decree of the President of the Russian Federation dated April 19, 2017 No. 176 On Strategy for Environmental Safety of the Russian Federation until 2025; the Decree of the President of the Russian Federation dated May 13, 2017 No. 208 On Strategy for Economic Security of the Russian Federation until 2030; the Order of the Government of the Russian Federation dated October 29, 2021 No. 3052-r On Approval of the Strategy for the Socio-Economic Development of the Russian Federation with Low Greenhouse Gas Emissions until 2050 to launch a comprehensive framework in adapting the economy to the global energy transition.

The adopted Resolution of the Government of the Russian Federation dated September 21, 2021, No. 1587, On Approval of the Criteria for Sustainable (including green) Development Projects in the Russian Federation and the Verification System Requirements for Financing Instruments for Sustainable Development in the Russian Federation is considered to be a significant step forward (Shmeleva, 2023). In the context of increasing sanctions pressure and shifting the economic interests of the state and business entities toward the East, the relevance of the environmental, social, and corporate governance (ESG) agenda in the Russian Federation would be enhanced.

The balance of a territorial system's natural, social, and economic subsystems is vital for sustainable development, with structural proportions, interaction mechanisms, and the interests of territorial community subjects being the priorities. The trend of moving the population into cities and increasing the share of the urban population in the regions of the Russian Federation should be interpreted as contravening ESG principles and reducing the level of sustainable territorial development. This assumption requires analytical research.

This article reviews the interrelation between urbanization and regional sustainable development, as evidenced by 85 constituent entities of the Russian Federation, varying in natural resource, financial, economic, geographical, institutional, and other development parameters. The study aims to provide a comprehensive analysis of the impact of urbanization on regional sustainable development, considering the diverse characteristics of the Russian regions and identifying key factors influencing this relationship. The findings will contribute to a better understanding of how urbanization processes can be managed to support sustainable development goals and address the challenges faced by different regions in the Russian Federation.

2. LITERATURE REVIEW

Since the urbanization rate has grown worldwide, including in the Russian Federation, it is urgent to consider these processes related to achieving global SDGs. Sustainable development is a complex and multidimensional challenge that requires a holistic and systemic approach to address human well-being's interrelated economic, social, and environmental aspects. The fundamental debate regarding sustainable development is whether we adopt a strong or a weak conception of sustainability.

Granberg et al. (2002) consider sustainable development as “stable, balanced socio-economic development that does not destroy the natural environment and ensures the continuous progress of society”. According to Tatarkin and others, “sustainable development of a region as a subject of specific socio-economic relations should mean balancing the four important factors: economic, socio-political, natural-ecological, and legal” (Tatarkin et al., 1999, p.7). Podprugin (2012) specifies regional sustainable development as a complex process that ensures balanced socio-economic and environmental development.

According to the author, it is necessary to consider the region's resource potential and its geographical, economic, industrial, infrastructural, and other features. Tsapieva believed sustainable development would be achieved through “balanced, safe, and effective

development to ensure the achievement of the intended goals and priorities of a social, environmental, and economic nature" (Tsapieva, 2010, p. 309).

Scientific research on the methodology for analyzing sustainable development of territories is characterized by a differentiated approach to studying specific aspects of this phenomenon in particular scientific disciplines. Such practice restricts identifying a generally accepted comprehensive methodology for assessing the level of sustainable development of a country, a region, and a city.

In turn, geographers, urbanists, economists, sociologists, architects, and representatives of other scientific disciplines carry out interdisciplinary research into urbanization processes. Numerous scholars explore the relationship between the urbanization factor and ESG development of territories. According to Feng and Li (2024), urbanization has proved to be a dominating factor in increasing ecological destruction. Loseva et al. (2019) attempted to investigate the impact of the urbanization process regarding megacities as regional centers on the sustainability of territorial development.

Sui et al. (2024) studied the relationship between urbanization and the ecological environment using the dynamic equilibrium model evidenced by Shandong Province in China. The long-term equilibrium analysis established that the long-term equilibrium relationship between the two can be achieved through short-term adjustment. Dong et al. (2024) found that the negative impact of spatial urbanization on ecological land use is not apparent in Liaoning Province in China, which indicates that the relationship between urbanization and environmental quality is not always a simple negative correlation.

A highly negative impact of urbanization on social development and the environment was revealed by Feng et al. (2019). It is shown that the urban-rural relationship is the most basic social and economic relationship, a topic that has become a hotspot for the sustainable development of territories. Based on panel data from 298 cities in China (2001 to 2013), the authors constructed the extended Cobb-Douglas model to measure the effect of land-centered urbanization on rural development and its spatial pattern characteristics. The results show that, from 2001 to 2013, China's urbanization level increased steadily, while the level of rural development showed a trend of declining first and then rising. Moreover, land-centered urbanization significantly promoted the development of rural areas nationwide, and urbanization's influence intensity displayed strong regional and particular characteristics.

Li and Liu (2021) explored the bidirectional relationship between urbanization and rural sustainable development in China based on panel data for 298 Chinese cities from 2000 to 2013. The empirical results suggest that most dimensions of urbanization and rural sustainable development in Chinese cities have had a positive bidirectional relationship

Pan et al. (2024) established the relationship between the level of urbanization and green development in the Yangtze River Economic Belt (YREB). However, cities have significant differences regarding their aggregate level and growth rate. The relationship between urbanization and urban green development in the YREB follows a "U" shaped curve, where urbanization initially hinders green development but later facilitates it.

Bai et al. (2019) concluded that a rising urban population share significantly influences residential CO2 emissions, as does population scale, GDP per capita, urban compactness, and the comprehensive level of urbanization. Moreover, urban population share positively affects residential CO2 emissions, surpassing the demarcation point (75%) in China's urban agglomerations.

Thus, the findings of the research above manifest ambiguous and contradictory results. Based on the conducted literature review, a research hypothesis was formulated: urbanization significantly impacts regional sustainable development in the Russian Federation, influencing various socio-economic and environmental dimensions in both positive and negative ways.

3. METHODOLOGY

To conduct the research, an abstract logical approach was used to summarize the key provisions of the sustainable development concept and evaluate the relevance of individual indicators. Econometric and statistical methods were applied for statistical data collection and analysis to assess the considered factors. Hypotheses and assumptions were employed to appraise the investigated factors and perform regression analysis. Economic and mathematical modeling methods were used to create regression models to validate the existence of a relationship between the reviewed factors. Graphic design and cartographic techniques were applied to translate research outcomes visually.

The data from the Federal Service for State Statistics of the Russian Federation (Rosstat), the Unified Interdepartmental Statistical Information System (UISIS), the National Rating Agency, the Statista Research Department, etc., were used as the critical research data sources evidenced from 85 constituent entities of the Russian Federation.

The sustainable development of the regional economy was evaluated using the integral ranking indicator for the sustainable development of the entity. In turn, the level of urbanization was assessed using the indicator for the share of the urban population of the total population in the region. This work aims to test the hypothesis regarding the importance of the urbanization factor for regional sustainable development rather than to create predictive models.

In the Russian Federation, a domestic system for assessing the sustainable development of economic entities has been elaborated recently. Various agencies and organizations are developing ESG ratings. About 15 large Russian companies were included in international ESG ratings from 2015 to 2016 (Babkin et al., 2023).

The emergence of national ratings in 2018-2022 influenced the behavior of Russian companies and regional authorities to develop sustainable development (seeTable 1).

TABLE 1. Comparative characteristics of Russian ESG ratings

Rating Provider	Rating Object	Methodology
Rating-Agentur Expert RA GmbH (RAEX-Europe)	Financial and non-financial enterprises, regions, financial and credit companies	The integral rating is calculated as a weighted average of the following areas: social, environmental, and governance.
Analytical Credit Rating Agency (ACRA)	Non-financial enterprises, regions, municipalities, mutual funds	The integral index is calculated as a weighted average of the following areas: ecology, social responsibility, and management.
Credit Rating Agency Expert RA	Enterprises, regions, urban districts	The integral index is calculated as a weighted average of the following areas: environment, society, quality of management, stress factors, and support factors.
National Rating Agency (NRA)	Financial and non-financial enterprises, regions, portfolios of management companies	The final rating calculation is based on qualitative and quantitative analysis using several fundamental and industry indicators grouped into three ESG components.
National Credit Ratings Limited (NCR)	Non-financial enterprises, regions, financial and credit companies	The basic ESG assessment is carried out for environmental, social, and governance factors; the resulting scores are summed up considering the factor weights; a comparative analysis is performed to differentiate ESG risks.

Note: compiled by author based on source Babkin et al. (2023)

The table overviews various ESG (Environmental, Social, and Governance) rating methodologies used by different Russian rating agencies. The comparison includes the types of entities being rated, the methods employed, and the specific factors considered in the ESG evaluation. This comparative overview highlights the diversity in ESG rating methodologies among Russian rating agencies, reflecting different emphases on various ESG factors and integration methods.

The conducted research was specified by the NRA Ranking of Sustainable Development and Integration of ESG Criteria into the Activities of Constituent Entities of the Russian Federation (National Rating Agency, 2022). This ranking was compiled for 85 regions of the Russian Federation using 45 indicators. Fourteen indicators were applied for the environmental (E) block, 17 indicators – for the social (S) block, and 14 indicators – for the governance (G) block (Konstantinidi et al., 2023). The higher the ESG score, the higher the region ranks (see Table 2).

The study employed descriptive statistics and Partial Least Squares Regression (PLSR). The dataset comprised indicators for different cities across multiple years, including variables such as population growth, average salary, and various economic metrics. The data was normalized using the Min-Max Scaler, facilitating a balanced comparison across various indicators. Next, cities were classified into three development categories - highly developed, moderately developed, and less developed - based on composite scores calculated from the normalized indicators. Scatter plots were generated, visually depicting the trends and development levels of different cities. For the final phase, PLSR analysis was conducted to test two hypotheses related to the impact of social and economic factors on the Gross Regional Product (GRP) of the cities.

The conducted literature review allows to identify key indicators for the study of urbanization process development. The indicators were then divided into two main groups economic and social (see Figure 2).

TABLE 2. Integrated groups of methodology indicators

Methodology Indicator	Data Source
Environmental (*E*) block of risk score indicators	
Environmental impact (air, water, and soil quality, waste management strategies)	Rosstat, Federal Service for Supervision of Natural Resources of the Russian Federation (Rosprirodnadzor)
Climate change (costs of air protection and climate change prevention)	Rosstat, the Ministry of the Russian Federation for Civil Defense, Emergencies and Elimination of Consequences of Natural Disasters of the Russian Federation (EMERCOM of Russia)
Resource utilization (scales of natural-resource consumption and the status of regional capital resources)	
Social (*S*) block of risk score indicators	
Population (demographic situation and migration flows)	Rosstat
Human capital (quality of life indicators and social development level)	Rosstat, the Federal Treasury of the Russian Federation, the Ministry of Internal Affairs of the Russian Federation
Sustainable development policy (a managerial component of ESG transformation in the region, including integration assessment of sustainable development agenda into strategic documents, specialized strategies and programs aimed at protecting the natural environment, increasing resource efficiency, etc.)	Regional Executive Authorities (ROIV), Regional Divisions of the Ministry of Natural Resources and Environment of the Russian Federation

Sustainable development management (managerial and economic indicators, including public-private partnership (PPP), capital accumulation rate, budget security, etc.)	Rosstat, the Ministry of Economic Development of the Russian Federation, Federal Treasury, Carbon Supersites of the Russian Federation

Note: compiled by author based on National Rating Agency, 2022

Standard correlation and regression analysis were used to establish the relationship between the urbanization factor of a region and sustainable development. By employing these methods, the study aimed to rigorously investigate the interplay between urbanization and sustainable development, providing a comprehensive understanding of how different levels of urbanization impact ESG factors across regions.

4. FINDINGS AND DISCUSSIONS

In the Russian Federation, as in many other countries, urbanization significantly impacts various aspects of public life, including economic development, infrastructure, standard of living, and social processes. Over the past decades, the proportion of the urban population in Russia has undergone significant changes, reflecting the country's general trends and challenges. Studying these changes makes it possible to understand better the processes taking place in Russian society and can serve as a basis for developing effective management and planning strategies.

Figure 1 presents the dynamics of the share of the urban population of the total population in the Russian Federation from 1990 to 2023.

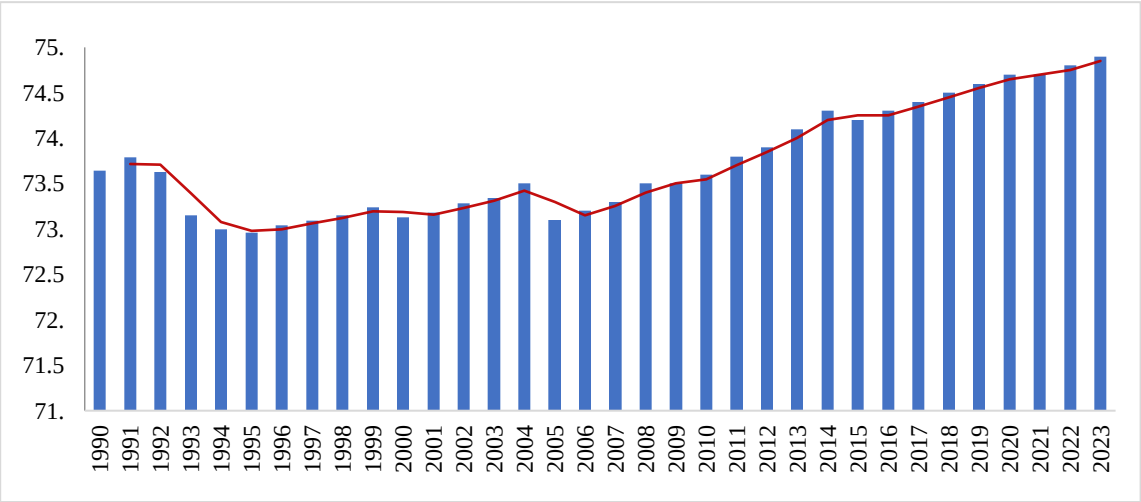

FIGURE 1. Dynamics of the share of the urban population of the total population in the Russian Federation for 1990-2023

Source: compiled by author based on source the UISIS (2023)

At the beginning of the period under review, from 1990 to 1993, there was a noticeable decrease in the proportion of the urban population. This phenomenon may be related to several factors, including the economic and social transformations in the country during that period. The early 1990s in Russia were characterized by a transition from a planned to a market economy, accompanied by significant economic difficulties, including rising unemployment and inflation. From 1994 to 2005, the urban population share shows minor fluctuations, remaining relatively stable. This period is characterized by the population's adaptation to new economic conditions and the gradual stabilization of the socio-economic

situation in the country. Starting from 2006, there is a consistent increase in the share of the urban population, which continues until 2023. Government policies aimed at modernizing urban areas and improving living conditions have contributed to an increase in the urban population.

Furthermore, the map presented in Figure 2 shows the share of the urban population as a percentage of the total population across different regions of the Russian Federation in 2022.

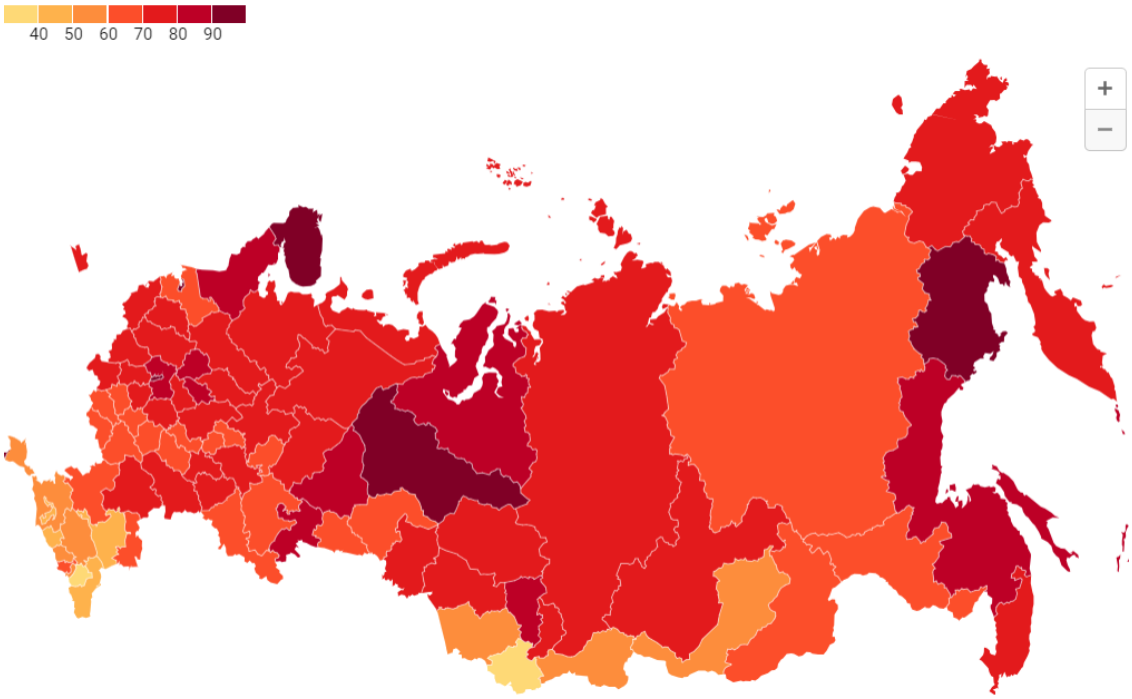

FIGURE 2. Map of the share of urban population in the Russian Federation in 2022, %

Source: compiled by author based on Degree of urbanization in Russia by federal district (2022)

The map uses a color gradient to represent varying levels of urbanization, with lighter shades indicating lower percentages of urban population and darker shades indicating higher percentages. There is significant regional variation in the share of the urban population. High urbanization levels are observed in the western part of the country and some eastern regions, as indicated by the darker shades on the map. The part of the west of Russia, including the Central Federal District, the Northwestern Federal District, and the Volga-Vyatka region, has historically been the center of economic and industrial activity. This area hosts the largest cities in the country, such as Moscow and Saint Petersburg, which are significant economic and cultural hubs. The high urbanization level in these regions can be attributed to the well-developed infrastructure, ample employment opportunities, and high standard of living, attracting people from less developed regions.

The lighter shades on the map indicate regions with low urbanization levels, primarily in the southern and far eastern parts of Russia. Southern regions, such as the North Caucasus Federal District, are characterized by a significant share of rural population and a historically agrarian lifestyle. These regions exhibit lower urbanization levels due to economic and social factors, including a need for more investment in urban development and

infrastructure, as well as traditional ways of life.

The highest degree of urbanization was recorded in the Northwestern Federal District of Russia, where 85% of the inhabitants lived in urban areas. This is followed by the Central Federal District, with an urbanization rate of 82.4%. The lowest share of the urban population, at 50.4%, was registered in the North Caucasian Federal District. There are differences in regional urbanization regarding various federal districts (see Figure 3).

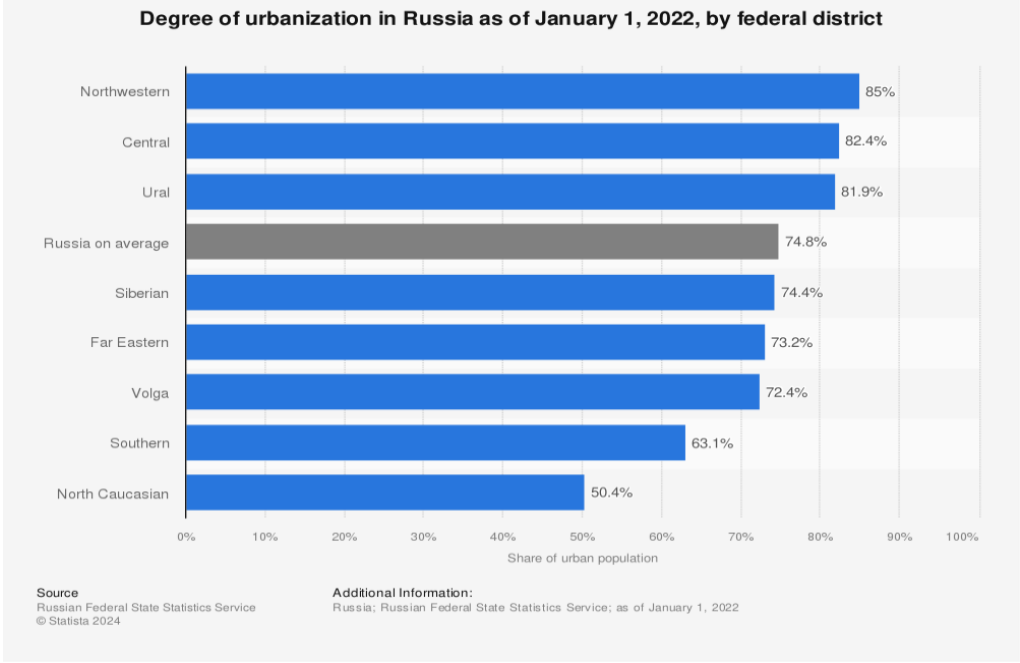

FIGURE 3. Degree of urbanization in Russian federal districts

Source: compiled by author Statista Research Department (2023)

The data is presented as the percentage share of the urban population within each district, providing a clear comparison of urbanization levels across the country. These variations in urbanization levels across federal districts reflect differing economic, historical, and geographic factors influencing population distribution in Russia. Regions with higher urbanization rates typically have more developed infrastructure, more excellent economic activity, and larger urban centers. Conversely, regions with lower urbanization rates may face challenges related to rural development and require targeted policy interventions to improve living conditions and infrastructure.

Notably, this trend is concurrently observed with the growth rate decline of both urban and rural populations in the Russian Federation (see Figure 4).

The graph illustrates the growth rate of the population in Russia from 1990 to 2022, segmented by type of area. The urban population growth rate exhibits considerable fluctuations throughout this period. A sharp peak is observed in the early 1990s, reaching about 1.5% in 1992, followed by a significant decline to negative growth in the mid-1990s. Another notable spike occurs in 2004, after which there is modest growth until around 2009. From 2010 to 2018, there was a slight positive trend, with growth rates peaking at around 1% before declining again towards 2022. The rural population growth rate generally remains negative throughout the entire period.

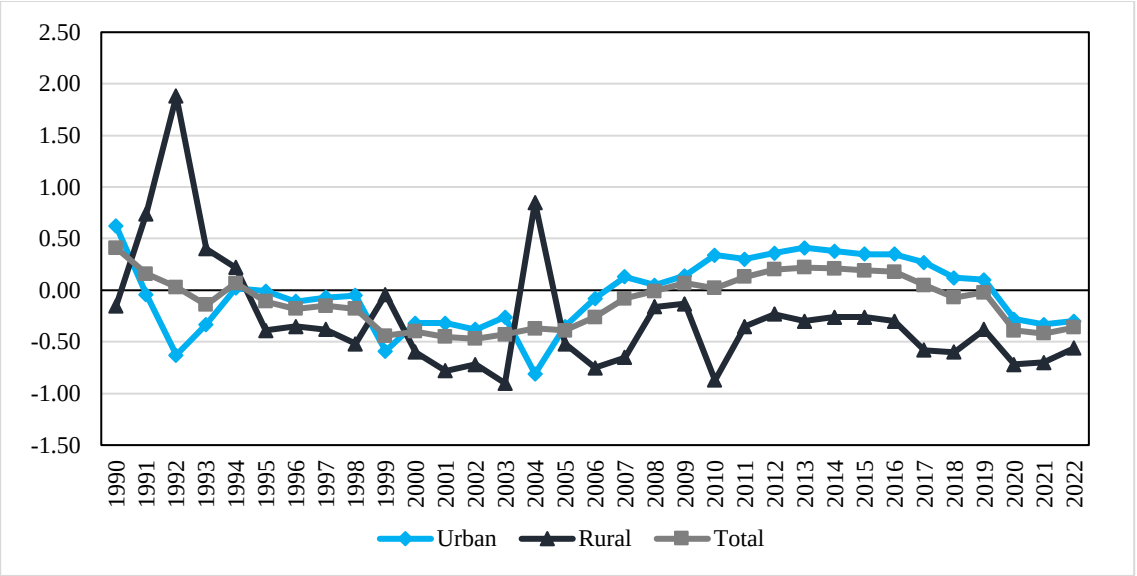

FIGURE 4. Growth rate of urban and rural population in the Russian Federation

Source: Statista Research Department (2023)

The overall trend indicates ongoing urbanization, with urban areas experiencing periods of positive growth, particularly during economic upswings. The consistently negative growth rates in rural areas suggest ongoing rural depopulation, driven by migration to urban centers, economic factors, and possibly declining birth rates in rural regions. However, the declining trend towards 2022 indicates potential demographic challenges ahead.

The average level of ESG assessment calculated for 85 regions of the Russian Federation is 0.528. It can be regarded as achieving ESG regional development in the Russian Federation by an average of 52.8% (see Table 3).

TABLE 3. ESG regional ranking

Leading Regions	Indicator Value	Lagging Regions	Indicator value
Moscow	0.781	Ivanovo Region	0.413
Republic of Tatarstan	0.769	Republic of Crimea	0.411
Tyumen Region	0.723	Republic of Tyva	0.41
Belgorod Region	0.702	Republic of North Ossetia-Alania	0.409
Saint Petersburg	0.683	Republic of Kalmykia	0.403
Yamalo-Nenets Autonomous Okrug	0.674	Republic of Dagestan	0.393
Krasnodar Territory	0.662	Republic of Ingushetia	0.393
Sakhalin Region	0.649	Republic of Karelia	0.392
Moscow Region	0.648	Pskov Region	0.382
Magadan Region	0.647	Republic of Khakassia	0.38

Note: compiled by author based on source National Rating Agency (2022)

The highest positions in terms of sustainable development are occupied by the federal city of Moscow (0.781), the Republic of Tatarstan (0.769), the Tyumen region (0.723), the Belgorod region (0.702), and the federal city of Saint Petersburg. These regions benefit from economic stability, substantial investments in sustainable initiatives, and effective management practices. Conversely, regions like the Ivanovo Region, the Republic of Crimea, and the Republic of Tyva occupy the lower end of the ranking.

These areas need improvements in terms of economic development, governance, and social infrastructure. Political instability, economic underdevelopment, and environmental issues contribute to their lower ESG performance.

The ESG ranking for E block is presented in Figure 5.

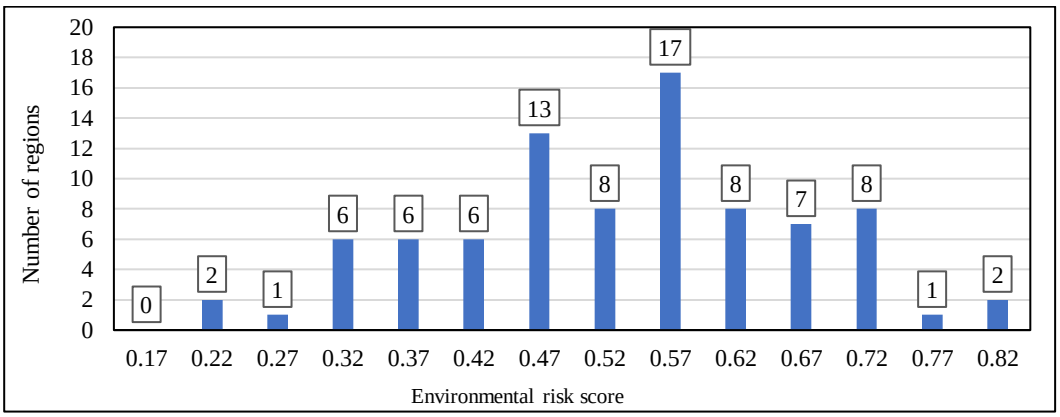

FIGURE 5. ESG ranking of Russian regions for *E* block

Note: compiled by author based on source National Rating Agency (2022)

Moscow and Saint Petersburg, are the leaders in environmental rating. The Republic of Tatarstan ranks second and then comes the Tyumen Oblast. The leading positions are ensured by large amounts of shipped goods manufactured and performed works and services that yield a minimum specific volume of air pollution per unit production. In turn, fixed asset depreciation endemic to the status of regional capital resources is relatively low in regions with advanced ESG rating levels.

The ESG ranking for S block is given in Figure 6.

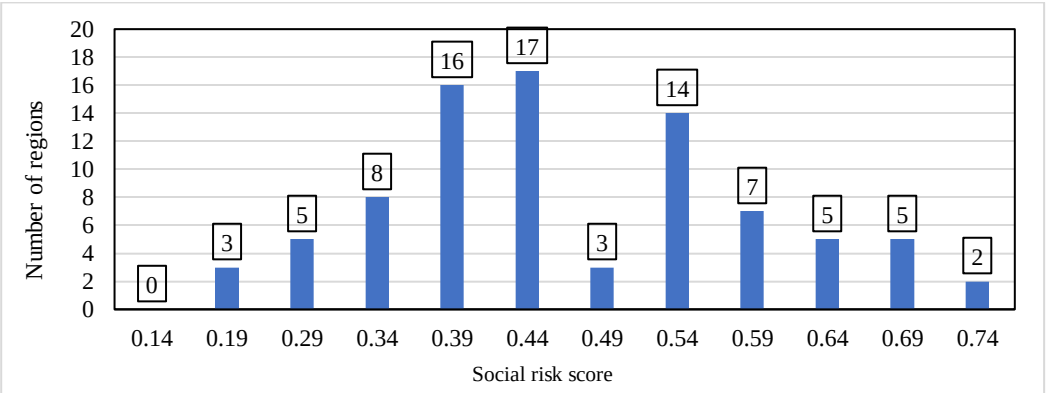

FIGURE 6. ESG ranking of Russian regions for *S* block

Source: compiled by the author based on National Rating Agency, 2022

Moscow and Saint Petersburg are absolute leaders in social rating, particularly in terms of income level for the population, housing affordability, and infrastructure. Moscow is among the highest life expectancy regions following the Republic of Dagestan and the Republic of Ingushetia.

The ESG ranking for G block is provided in Figure 7.

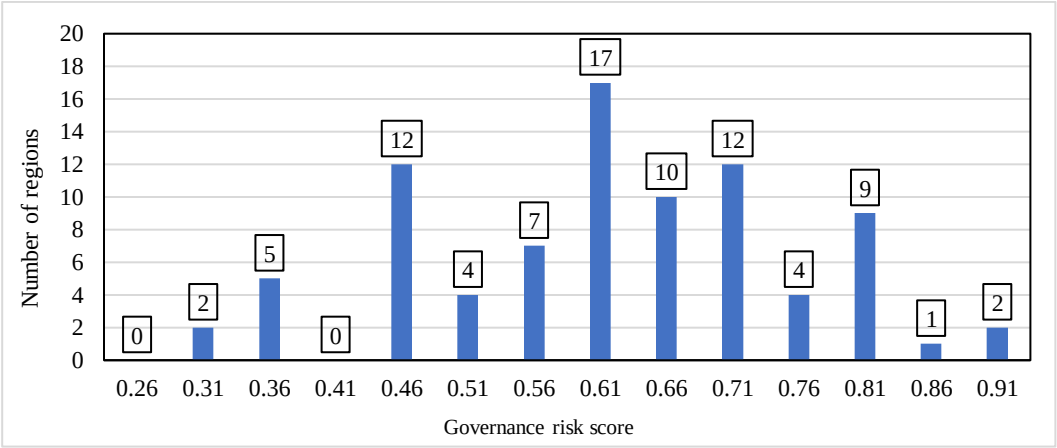

FIGURE 7. ESG ranking of Russian regions for *G* block

Source: compiled by the author based on National Rating Agency, 2022

It is noteworthy that the regions are poorly differentiated in G block (16 regions received maximum scores). Most regions (80 constituent entities of the Russian Federation) have integrated the principles and postulates of sustainable development into the context of regional socio-economic development strategies; 84 regions have their own strategies for environmental protection. Moreover, the regions have launched the process of developing specialized strategies for sustainable socio-economic development since 2022, and the Lipetsk Region will be the leader in advancing this strategy until 2030.

As for building relationships with indigenous peoples inhabiting 34 regions, this aspect has been integrated into the legal framework of 32 regions. The indicators

regarding the economic aspects of this rating block generally typify regional financial capabilities for pursuing a long-term sustainable development policy, assessing the development of public-private partnerships of economic entities, investment activity, and the rate of capital accumulation as the basis for ESG transformation, as well as GRP per capita and budgetary capabilities of the entity. Accordingly, four regions are assigned zero scores, while eight regions have maximum scores. Overall, regional differentiation apropos this economic component of G block is high enough.

Thus, the Student's t-test indicates a significant relationship between the investigated indicators stated in the following econometric model:

$$Y_i = 0.292712^{***} + 0.00333^{***} X_i, \quad (1)$$

where X_i is the level of urbanization assessed using the indicator for the share of urban population of total population in the region as of January 1, 2022;

Y_i - is the level of sustainable development of the region calculated using the integrated 2022 ESG index;

i - is the index number of regions (1…85) in the Russian Federation.

Regression modeling strategies were applied to establish the relationship between the degree of urbanization and regional sustainable development rating (Tables 4-5).

TABLE 4. Regression statistics

Indicators	Values
Multiple regression coefficient *R*	0.467234619
Determination coefficient *R*-squared	0.218308189
Normalized coefficient of *R*-squared determination	0.208890215
Standard error	0.082263139
Observations	85

Note: compiled by author

TABLE 5. Regression analysis results

Indicators	Coefficients	Standard Error	t-statistic	p-value
Y-intercept	0.292712	0.049899	5.866103	8.81E-08
Urbanization variable	0.00333	0.000692	**4.814556**	6.54E-06

Note: compiled by author

The coefficient of determination was 0.218 (Table 4). Since this model can only clarify 21.8% variation for regional sustainable development indicators, it is unsuitable for forecasting purposes. A moderate positive relationship (r = 0.47) indicates that the higher the urbanization of the territory, the higher the level of sustainable development of the region.

Though the analysis results have revealed a rather high sustainability level of urbanization processes in Russian regions, sustainable development ratings must consider enhanced center-periphery spatial polarization. Currently, the cities attract the most available resources to the area, including production factors and human capital. The present economic policy is focused on urban agglomerations, which should become promising centers for federal and regional socio-economic growth and development (Spatial Development Strategy of the Russian Federation, 2019). Thus, cities are the sources of economic growth and development, while the population outflow from rural areas is swiftly increasing. In turn, the spatial development of the rural regions and small towns needs to be paid more attention to. Such "desertification" of rural areas is neither taken into account nor included in the assessment methodology when calculating ratings of regional sustainable development.

The indices of regional sustainable development should likely include extra indicators characterizing the local level of the economic system, the status of rural areas, and urban-rural development proportions. Rural areas are national strategic resources, the importance of which is rapidly growing in the context of increasing emphasis on natural and territorial resources in the country's development. In our opinion, greater emphasis should be placed on assessing economic, institutional, infrastructural, environmental, and other conditions at the level of local communities. The latter have scarce opportunities for sustainable socio-economic development, providing remoteness from urban centers (depopulation, aging population, poverty, unemployment, low quality of life, digital divide, etc.). This is urgent for the sustainable development of the Russian Federation, given its spatial extent and territorial heterogeneity.

The current state of affairs stems from the imperfection of statistical accounting at the level of local rural communities, shifting the focus of academic research towards regions or the country as a whole. According to Zamyatina and Pilyasov (2013), using both federal and regional statistics, macro data, and micro data on economic entities and households to research small territories is vital.

5. CONCLUSIONS

The study provides a comprehensive analysis of the impact of urbanization on regional sustainable development within the Russian Federation. By examining the data from 85 regions, this research identified a moderate positive relationship between urbanization levels and regional sustainable development indicators. Specifically, the regression analysis revealed that an increase in the share of the urban population is associated with higher sustainable development ratings of the regions. However, the model accounts for only 21.8% of the variance in sustainable development indicators.

The data showed significant regional differences in urbanization levels. The highest levels of urbanization are observed in the Central and Northwestern Federal Districts, where the largest cities of the country, such as Moscow and St. Petersburg, are located. On the contrary, low levels of urbanization are typical for southern and Far Eastern regions, such as the North Caucasus Federal District. Key findings indicate that regions with higher urbanization tend to have better sustainable development outcomes, primarily due to enhanced economic activities, better infrastructure, and more robust social services available in urban areas. However, this urban-centric development approach also exacerbates the challenges faced by rural areas, including depopulation, aging populations, poverty, and limited access to essential services and infrastructure.

The analysis underscores the importance of integrating rural development indicators into sustainable development assessments to achieve a balanced and holistic view. It is crucial to address the spatial disparities between urban and rural areas by promoting policies that foster inclusive growth and ensure that rural regions are not left behind in the development process. This includes improving statistical accounting at local levels, enhancing infrastructure, and creating economic opportunities in rural areas to mitigate the negative impacts of urbanization.

Future research should focus on developing more refined models that incorporate a broader range of factors influencing sustainable development. Additionally, there is a need for policies that enhance the coordination between urban and rural development, ensuring that both areas can contribute to and benefit from the nation's overall sustainable development strategy. Emphasis should be placed on creating resilient, inclusive, and sustainable communities that align with the broader goals of the Environmental, Social, and Governance (ESG) agenda.

The findings of this study contribute to the ongoing discourse on sustainable development and urbanization, providing valuable insights for policymakers, researchers, and stakeholders involved in regional planning and development. By adopting a more inclusive and integrated approach to sustainable development, the Russian Federation can better address the diverse needs of its regions and promote a more equitable and sustainable future for all its inhabitants.

AUTHOR CONTRIBUTION

Writing – original draft: Leyla Gamidullaeva.
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Formal analysis and investigation: Leyla Gamidullaeva.
Funding acquisition and research administration: Leyla Gamidullaeva.
Development of research methodology: Leyla Gamidullaeva.
Resources: Leyla Gamidullaeva.
Software and supervisions: Leyla Gamidullaeva.
Data collection, analysis and interpretation: Leyla Gamidullaeva.
Visualization: Leyla Gamidullaeva.
Writing review and editing research: Leyla Gamidullaeva.

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RESEARCH ARTICLE
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Enhancing Cultural Competence through University-Business Collaboration: The Case of the Caspian Region

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ABSTRACT

The accelerating pace of globalization and digital transformation presents significant challenges and opportunities for higher education institutions, particularly in regions undergoing rapid economic and educational transformations such as the Caspian area. This study examines the implementation of innovative educational methodologies within the Erasmus PICASP Project, specifically focusing on the integration of Massive Open Online Courses (MOOCs) and Practice Enterprises (PE) to enhance university-business collaboration in the Caspian area. By leveraging MOOCs for scalable, flexible learning and PEs for hands-on business management experience, the project fosters critical skills such as problem-solving, teamwork, and adaptability. There are covered the project's framework, educational approaches, and the potential impacts of these methods on the education landscape management, highlighting the shift towards multidisciplinary learning environments that integrate digital technologies. The project reported improved student engagement, enhanced practical skills, and increased employability of graduates. The findings highlight the importance of integrating local contexts with global educational standards to enhance employability and competitiveness, particularly in regions with diverse economic and educational landscapes. Furthermore, future research can contribute to the ongoing development and refinement of educational and cultural tools, ensuring they remain effective and relevant in an ever-evolving global landscape.

KEYWORDS: Urbanization, Sustainable Development, Economic Development, Regions, Spatial Differences, Spatial Polarization, Environmental Sustainability, Russia

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JEL Code: O31, O32, O33

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1. INTRODUCTION

The accelerating pace of globalization and digital transformation poses significant challenges and opportunities for higher education institutions worldwide. Central to these challenges is the need for universities to effectively bridge the gap between academic theories and practical applications, particularly in the context of university-business collaborations. This is especially pertinent in regions undergoing rapid economic and educational transformations, such as the Caspian area. The PICASP Project, a collaborative initiative between the University of Bologna and the University of International Business in Almaty, Kazakhstan, along with other partners, seeks to address these challenges by integrating innovative educational tools like Massive Open Online Courses (MOOCs) and Practice Enterprises (PEs).

The project builds on a longstanding relationship that began in 2005 with efforts to introduce the European Credit Transfer and Accumulation System (ECTS) in Kazakhstan, underpinning a broader commitment to enhancing educational standards and facilitating international cooperation. The integration of MOOCs and PEs represents a further evolution of this commitment, aiming to modernize educational methodologies and enhance students' practical skills and cultural competencies within a framework of international collaboration. Globalization and digital transformation have fundamentally altered the landscape of higher education, necessitating new approaches to learning and teaching. As industries evolve and become more interconnected, there is an increasing demand for graduates who possess theoretical knowledge, practical skills, and cultural competencies that can be applied in real-world settings. This demand is particularly acute in the Caspian region, where rapid economic growth and diversification efforts are underway.

The dissemination of experience, particularly concerning the ongoing PICASP Project, places PE and MOOCs in two different perspectives. On the one hand, PEs are subject to the concentration of teaching in a classroom with direct and personal relationships between the teaching staff and learners. On the other hand, in Tempus and Erasmus projects where the beneficiary partners, without any experience in PE, have locations mainly distributed over long distances, the use of MOOCs can contribute to the rapid preparation of the PE Teaching Staff. MOOCs and PEs offer a promising solution to these challenges. MOOCs provide accessible, flexible, and scalable learning opportunities, allowing students to engage with high-quality educational content from anywhere in the world. This is particularly beneficial in regions where traditional educational resources may be limited or where institutions are geographically dispersed. Practice Enterprises, on the other hand, create simulated business environments where students can gain hands-on experience in managing real-world business operations. This experiential learning model helps bridge the gap between academic theories and practical applications, fostering critical thinking, problem-solving, teamwork, and cultural competency skills.

The PICASP Project also focuses on the importance of integrating local contexts with global educational standards. Recognizing the Caspian region's unique cultural, economic, and educational landscapes, the project tailors its approach to ensure relevance and applicability. This involves customizing MOOCs and PEs to address local industry needs while adhering to internationally recognized educational standards. Such an approach not only enhances the employability of graduates in the local job market but also prepares them to compete and collaborate on a global scale. The need for such innovation in educational practices is underscored by the evolving demands of the global labor market, which increasingly values the ability to adapt to rapidly changing technologies and economic

conditions. This is particularly critical in the Caspian region, where economic diversification efforts are intensifying in response to the global shift towards sustainable development and knowledge-based economies. By enhancing the practical skills and cultural competencies of students and fostering closer university-business collaborations, the PICASP Project aims to prepare graduates who are well-equipped to meet the challenges of the modern workforce.

However, applying MOOCs and PEs in this context also presents several challenges. These include the need to ensure the quality and relevance of the courses offered, the integration of these tools into existing educational frameworks, and the engagement of local and international businesses in the educational process. Ensuring the quality and relevance of MOOCs and PEs requires close collaboration with industry experts to design curricula that reflect current market needs and trends. Additionally, integrating these tools into existing educational frameworks necessitates careful planning and coordination with academic institutions and regulatory bodies. Another significant challenge is navigating varying levels of infrastructure and digital literacy among partner institutions and their respective student bodies. In regions where access to reliable internet and modern technology may be limited, innovative solutions are needed to ensure that all students can benefit from MOOCs and PEs. This may include investments in technological infrastructure and training programs to enhance digital literacy among students and faculty.

The PICASP Project emphasizes the concept of lifelong learning and continuous improvement, which are crucial in today's fast-paced and ever-changing world. The project encourages students, faculty, and industry partners to remain adaptable and resilient by instilling a culture of continuous learning and professional development. This commitment to ongoing education ensures that individuals can continuously update their skills and knowledge, keeping pace with technological advancements and industry trends. Furthermore, the project aims to create a sustainable model for educational innovation that can be adapted and expanded upon in the future, fostering a legacy of excellence in higher education.

This introduction sets the stage for a detailed exploration of how the PICASP Project addresses these challenges through the innovative use of MOOCs and PEs. It also examines the impact of these educational tools on students' preparedness for the workforce, the enhancement of university-business collaborations, and the broader implications for management education in the region. The following sections will delve deeper into the project's methodology, implementation, results, and strategic implications for all stakeholders involved. Through this comprehensive approach, the PICASP Project aims to contribute to the ongoing evolution of higher education in the Caspian region, fostering a new generation of skilled and adaptable professionals.

2. LITERATURE REVIEW

Integrating Massive Open Online Courses (MOOCs) and Practice Enterprises (PEs) in higher education represents a significant shift in pedagogical approaches to foster industry-relevant student skills (Liyanagunawardena et al., 2013). The literature indicates that MOOCs provide accessible, flexible, and diverse learning opportunities, which are crucial for lifelong learning and continuous professional development. Meanwhile, PEs offer simulated real-world business environments that enhance practical skills and entrepreneurial capabilities (Ratten, 2014).

The effectiveness of MOOCs in university-business collaboration is well-documented. MOOCs facilitate a bridge between theoretical knowledge and practical skills, making them essential to modern education strategies, especially in rapidly developing regions (Welsh & Dragusin, 2013). They are particularly effective in delivering content that aligns with the needs of local and global

businesses, thereby enhancing student employability (Tan et al., 2024).

On the other hand, PEs simulate the dynamics of natural business environments, offering students hands-on experience in managing operations, finance, marketing, and human resources within a controlled setting. This experiential learning model reinforces theoretical knowledge and cultivates critical soft skills such as problem-solving, teamwork, and decision-making (Hauptman & Cohen, 2011). However, integrating these innovative educational tools into existing curricula poses challenges, including technological requirements, the need for skilled instructors, and alignment with academic standards (Garrison et al., 2010). Moreover, while MOOCs and PEs offer substantial benefits, their impact varies significantly based on the context of their implementation, suggesting the need for careful planning and adaptation to local conditions (Bali, 2014).

The literature also suggests a growing trend towards multidisciplinary approaches in higher education, which blend digital technologies with traditional learning to create more dynamic, engaging, and practical educational experiences (Clark, 2013). As such, the collaboration between universities and businesses through projects like PICASP enhances educational outcomes and contributes to regional economic development, aligning educational objectives with the strategic goals of local industries (Porter & Kramer, 2019).

Incorporating Massive Open Online Courses (MOOCs) and Practice Enterprises (PEs) into higher education frameworks, particularly in the context of university-business collaboration, can be further contextualized by examining the broader discourse on education reforms and methodology innovations in transition economies and managerial development. Key contributions in the literature provide an essential foundation for understanding these dynamics.

Bianchi and Tampieri's works have been instrumental in examining the transition of educational systems, mainly through the European Credit Transfer and Accumulation System (ECTS), which aims to harmonize educational standards across Europe. Their publications, including how to manage ECTS with training aids for teachers (Bianchi & Tampieri, 2007a) and the networking approach to ECTS in Kazakhstan (Bianchi et al., 2007), highlight the critical role of adaptive educational methodologies in fostering international collaboration and enhancing educational quality in transition countries.

Further, Bianchi and Tampieri (2005) discuss lifelong learning and managerial development in transition countries, emphasizing the necessity of continuous education in adapting to global economic and managerial trends. This perspective is vital in understanding the backdrop against which MOOCs and PEs are implemented, suggesting that these tools could serve as crucial components in the evolving landscape of educational reform aimed at enhancing managerial competencies and practical skills.

The European Commission's report on pilot courses and new didactics for teacher training in cultural tourism (2020) also contributes to this discussion by providing a contemporary example of how innovative educational methodologies are being deployed specifically in Caspian. This initiative underscores the relevance of tailored educational tools that meet specific regional developmental needs.

In a critical examination of traditional business education, Martin (2018) advocates for fundamentally rethinking business schools, suggesting a shift towards more integrated and practical learning approaches such as those provided by MOOCs and PEs. This critique aligns with the broader debates on the efficacy of traditional educational models in meeting the challenges of modern business environments.

Rowthorn and Ramaswamy (1997) discuss the broader economic shifts such as deindustrialization, which further contextualizes the need for educational systems to adapt to rapidly changing economic landscapes. This economic backdrop is crucial for understanding the pressures on educational

systems to evolve and cater to new economic realities.

The works of Bianchi (2024) on the eclectic studies in business economics and Poettinger's (2021) examination of historical judgment on post-war economic policies introduce a nuanced understanding of how historical and economic contexts influence educational needs and responses. Bianchi's exploration of eclecticism in Italian business studies (Bianchi, 2023) particularly highlights the ongoing evolution of educational paradigms in response to changing societal and economic demands.

Additionally, the simulated enterprise model discussed by AAVV (2003-2008) in their analysis of the Forlì business simulation lab and PERTING Srl's activities provides a practical example of how theoretical concepts can be effectively integrated into real-world applications, enhancing both learning outcomes and student preparedness for professional challenges.

Together, these sources weave a complex narrative on the evolution of educational methodologies, underlining the necessity for innovative approaches like MOOCs and PEs in addressing contemporary challenges in education and workforce preparation in a globalized economy. These references support the need for such innovations and provide a rich context for their evaluation and potential impact.

3. RESEARCH METHODS

The methodology of the PICASP Project incorporates a mixed-methods approach to evaluate the integration and effectiveness of Massive Open Online Courses (MOOCs) and Practice Enterprises (PEs) in fostering university-business collaboration for the development of the Caspian area. This research design allows for a comprehensive understanding of the educational interventions' quantitative outcomes and qualitative insights.

The quantitative aspect of the study involves collecting data from various sources, including enrollment numbers, completion rates, and performance metrics from MOOCs, as well as productivity and competency assessments within the Practice Enterprises. This data is gathered using the universities' digital learning management systems, which systematically track user progress and engagement metrics. Pre- and post-intervention assessments are conducted to measure the knowledge and skills of students participating in the programs. These assessments are designed to evaluate the effectiveness of MOOCs and PEs in enhancing students' managerial and entrepreneurial capabilities.

Also, in this case, it was essential, for the fulfillment of the project, the preparation of The Teaching Staff (Teachers, Tutors, and Menthors) throughout MOOCs, with particular attention to the coaching activity having the purpose of creating a real team and an adequate network among the staff. This attitude was replied to the project management applied to PE Courses.

The teacher's primary role is to recruit learners, focus the classroom on PE targets, coordinate teaching staff, evaluate results, and motivate learners. Teachers provide overarching academic guidance and ensure the alignment of PE activities with educational goals. Tutor: Tutors support Teachers and Mentors in their relationships with students, ensuring continuity of learners' engagement with PE targets. They assist in facilitating the learning process and provide additional academic support to help students achieve their goals. Mentor: Mentors bring practical experience to the PE activities, supervise learners' activities within the PE, and ensure the feasibility of the chosen targets and sustainability of PE strategies. They offer real-world insights and professional guidance to bridge the gap between theory and practice.

The positions involved in PE can be summarized as Figure 1 where the main tasks required are also indicated.

Qualitative data is collected through semi-structured interviews and focus groups with participants. These interviews aim to gather in-depth insights into the participants' experiences and the perceived value of the educational tools used in the project.

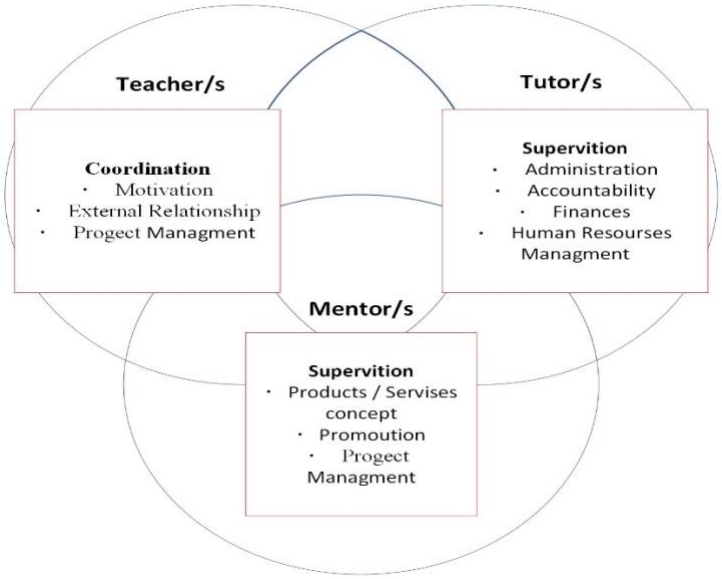

FIGURE 1. Central positions involved in the learning approach by Practice Enterprise

Note: compiled by authors

Focus groups help explore the collective impact of the interventions on teamwork, problem-solving skills, and readiness for the labor market. Additionally, case studies of selected students and businesses are developed to document detailed stories of transformation and success.

This elects MOOCs as an appropriate tool for preparing the teaching staff. This does not mean that the experience in the PE classroom field is not helpful for the teaching staff. On the contrary, with the use of MOOCs, the preparation of the Teaching staff can be concentrated in the shortest possible time they previously received preparatory training by MOOCs.

The procedure followed in project activities is summarized in Figure 2, which includes the phases of recruitment and teaching activities.

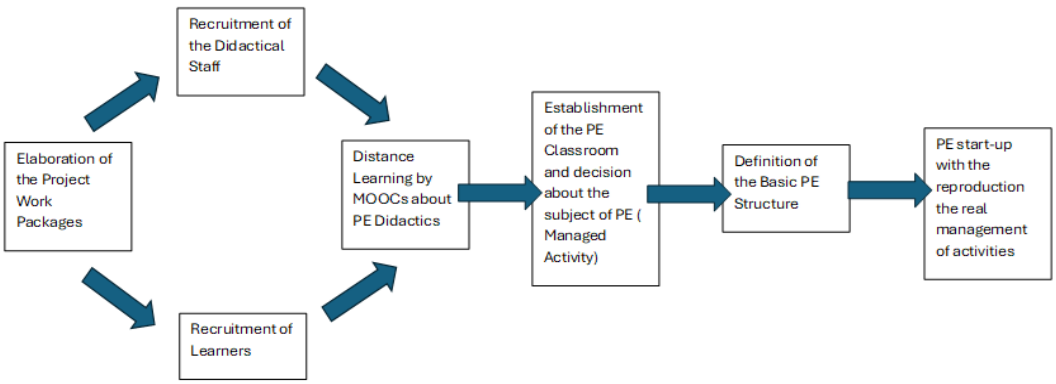

FIGURE 2. Procedure for the Preparation of the Implementation Project with the use of PE and MOOCs

Note: compiled by authors

The process encompasses several critical objectives to implement the Practice Enterprise (PE) framework effectively. Initially, the recruitment of qualified teaching staff is essential to ensure the delivery of high-quality education and guidance. Subsequently, establishing the PE location, which serves as the classroom, is crucial for providing a conducive learning environment. Following this, the recruitment of learners, or students, is undertaken to engage participants who will benefit from the PE experience. An inaugural meeting with these students is then conducted to introduce the program and set expectations. During this meeting, the basic structure of the PE is defined through the development of an organizational chart. This chart outlines the various roles and responsibilities within the PE, allowing for the unambiguous assignment of tasks and duties to each learner, thereby facilitating an organized and efficient operational framework. Fundamental to the PE learning process is the use of new technologies (virtual reality, augmented reality, and distance learning. Seminars, tutorials, work groups) that must be applied intensively with the support of adequate equipment in dedicated classrooms. It is also essential that in the classroom if used by several courses, there is a room or container in which to store the PE material, which can only be accessed by the Teaching Staff.

The methodology also details the specific implementation processes of MOOCs and PEs. MOOCs are designed in collaboration with industry experts to ensure relevance to current business needs and are delivered via a platform that supports interactive learning, such as quizzes, peer interactions, and real-time feedback. The Practice Enterprises are set up to simulate real-world business environments within the universities, allowing students to run virtual companies with real-world business processes and decision-making.

Quantitative data is analyzed using statistical methods to identify patterns and outcomes related to the effectiveness of the educational interventions. This includes using descriptive statistics to summarize data and inferential statistics to test hypotheses about the impact of MOOCs and PEs on student learning outcomes. Qualitative data analysis involves thematic analysis to extract common themes from the interviews and focus groups, providing nuanced insights into participants' subjective experiences.

All research activities comply with ethical standards, including obtaining informed consent from all participants, ensuring the confidentiality of participant data, and using data solely for the purposes of this research. The project's methodology is reviewed and approved by the institutional review boards of the participating universities.

This mixed-methods approach is designed to provide a robust analysis of the educational interventions, offering both breadth and depth in understanding how MOOCs and PEs can enhance university-business collaboration and improve educational outcomes in the Caspian area. Through this methodology, the project aims to generate actionable insights that can inform future educational practices and policies in similar contexts.

4. FINDINGS AND DISCUSSIONS

Given that the primary themes of the PICASP Project revolve around Cultural Heritage and Related Tourism Activities, the Practice Enterprise (PE) philosophy is geared toward traditional initiatives that promote virtuous behavior among citizens in support of Cultural Heritage. This philosophy emphasizes fostering an understanding and appreciation of cultural heritage through humanities education, encouraging and supporting cultural initiatives, advocating for and contributing to the development and enforcement of legislation against illegal activities and vandalism in cultural heritage, supporting and collaborating with cultural associations, and organizing and participating in fundraising efforts to secure financial resources necessary for the preservation and enhancement of cultural heritage sites and activities. This approach ensures a comprehensive and multifaceted strategy to safeguard and promote cultural

heritage within the context of the PICASP Project.

Another condition for the initiative's success is the creation of an accounting information system that must be constantly updated by students in charge of the administrative office. The following table outlines the Practice Enterprises (PEs) created by UIB PE Classrooms as part of the PICASP Project (2020-2024). Each PE is associated with specific roles, including Teachers, Tutors, and Mentors, who play distinct and crucial roles in guiding students through practical, real-world business scenarios. As it concerns UIB the Practice Enterprise Classrooms were structured as follows (Table 1).

TABLE 1. Practice Enterprises created by UIB PE Classrooms in the PICASP Project (2020-2024)

Enterprise	Description	Teacher	Tutor	Mentor
Unitour	Research into the tourism and recreational potential of Kazakhstan and global destinations. Creation and organization of ethnic, cultural, recreational, and gastronomic tours.	Nussupova Larissa, Head of the UIB Department of Tourism and Hospitality	Petriscsheva Nina, UIB Department of Tourism and Hospitality	Aznazarov Alexandr, Discover Almaty Executive Director
Jas qanat	Organization of activities for the tour operator Jas Qanat, focusing on developing and providing tourist packages.	Sadykova Zhanar, Head of the UIB Department of Business	Nussupova Larissa, Head of the UIB Department of Tourism and Hospitality	Aznazarov Alexandr, Discover Almaty Executive Director
Mystical Kazakhstan	Exploration of abandoned places in Kazakhstan.	Nussupova Larissa, Head of the UIB Department of Tourism and Hospitality	Ella Pak, Senior Lecturer, UIB Management Department	Saburzhan Saidullayev, SM Travel Directo

Note: compiled by authors

The table illustrates the structure and focus of the Practice Enterprises (PEs) established within the PICASP Project, detailing the specific educational and managerial roles involved. These PEs—UNITOUR, JAS QANAT, and MYSTICAL KAZAKHSTAN—each address distinct aspects of the tourism industry, providing students with opportunities to engage in practical, real-world business activities. UNITOUR focuses on researching and promoting the tourism potential of Kazakhstan and international destinations, with students involved in creating and organizing diverse tour packages. JAS QANAT emphasizes the development and provision of tourist packages by the tour operator, offering students hands-on experience in managing tour operations. MYSTICAL KAZAKHSTAN explores niche tourism markets by promoting tours to abandoned places in Kazakhstan, thus providing unique educational insights.

The basic structure of a PE can be summarized in Figure 3, which represents the structure of PERTING, the PE created in 2003 by the Faculty of Economics of the Forlì Campus of the University of Bologna.

UNITOUR focuses on researching and promoting the tourism potential of Kazakhstan and international destinations. Students involved in this enterprise participate in the creation and organization of diverse tour packages encompassing ethnic, cultural, recreational, and gastronomic experiences.

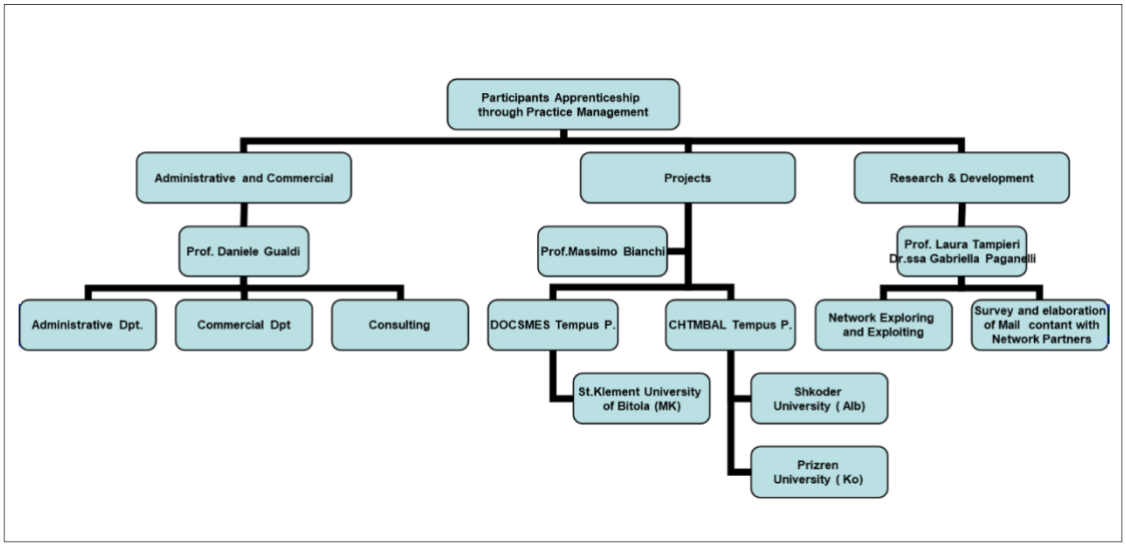

FIGURE 3. PERTING PE in 2003

Note: compiled by authors

The diagram effectively captures the interconnected roles and departments within the PERTING PE, showcasing a well-structured approach to integrating practical management training with academic and professional development. This structure allows students to gain hands-on experience in a simulated business environment, preparing them for real-world challenges in their future careers. Moreover, the collaborative nature of PORTING PE fosters teamwork and communication skills, as students must work together to solve problems, make strategic decisions, and achieve common goals. This alignment between theory and practice is crucial in developing critical thinking and problem-solving abilities, which are highly valued in any professional setting. Overall, the PERTING PE structure provides a robust platform for students to transition smoothly from academic settings to professional environments.

The necessary basic information is shown in Table 2 for the creation of new courses.

TABLE 2. The Basic Course Information Sheet for Practice Enterprise

No	What Practice Enterprise new courses will the PICASP project implement in your HEI?
1	For each course, please state:
2	Title
3	Level of study
4	List of subjects and credits for each of them
5	Estimated date of accreditation and accreditation body
6	Number of students to be accepted in the first year/ second year
7	Number of teaching staff to be trained
8	Internship /placements (if applicable)
9	What is the list of equipment to be purchased for this course, and for what purpose? (if applicable)
10	Date of submission to intra-university organs
11	Date of accreditation
12	Date of implementation (up and running)

Note: compiled by authors

For the materials produced, the primary activities to be undertaken by each participant are outlined with specific objectives. Firstly, students must identify the training process by rotating within various departments. This involves carrying out predefined tasks at each workplace, with the duration of their stay in each department contingent on achieving set objectives. This rotation aims to comprehensively understand the operational dynamics across different facets of the simulated company. Additionally, the program is designed to develop critical behavioral skills within the simulated enterprise and in interactions with other domestic and international companies. Participants are expected to provide adequate and consistent responses to the needs of real customers and suppliers, thereby enhancing their practical business acumen.

From the beginning, the Simulated Enterprise of Bologna, called PERTING SRL, has been involved in the planning and implementation of International Projects, of which those implemented in the last decade are listed in Table 3.

TABLE 3. Projects in which Simulimpresa/Practice Enterprise has been applied

Project Acronym	Project Subject	Project Grant Holder	Countries Involved	Period	Distance Learning
DOCSMES	TEMPUS - Regional Joint Doctoral Programme in Entrepreneurship and SME Management for Western Balkan Countries	University of Bologna	Albania, Italy, Kosovo, Republic of Macedonia, Poland, Spain	2010-2014	Simulimpresa/Practice Enterprise
CHTMBAL	TEMPUS - Network for Post Graduate Master in Cultural Heritage and Tourism Management in Balkan Countries	Gabriele D'Annunzio University of Chieti-Pescara (IT)	Italy, Poland, Kosovo, Albania, Spain	2014-2016	Simulimpresa/Practice Enterprise
RESINT	ERASMUS - Collaborative Reformation of Curricula on Resilience Management with Intelligent Systems in Open Source and Augmented Reality	Unibo Campus Forlì (IT)	Italy, Lithuania, Spain, United Kingdom	2013-2015	Simulimpresa/Practice Enterprise
BECK	ERASMUS - Integrating Education with Consumer Behavior Relevant to Energy Efficiency and Climate Change at the Universities of Russia, Sri Lanka, and Bangladesh	Vilnius Gedeminias Technical University Vilnius (LT)	Bangladesh, Italy, Lithuania, Russia, Sri Lanka, United Kingdom	2019-2022	Simulimpresa/Practice Enterprise - MOOCs

HEIPNET	ERASMUS+ - Inclusion of Innovative Work-Based Learning and Business Partnerships in HEI Curricula Development	University of Pavia (IT)	Austria, Germany, Italy, Lithuania	2020-2022	Simulimpresa/Practice Enterprise - MOOCs
PICASP	ERASMUS+ - Pilot Courses and New Didactics for Teachers Training in Cultural Tourism for the Development of the Caspian Area	University of Chieti (IT)	Azerbaijan, Italy, Kazakhstan, Lithuania, Poland, Russia	2021-2023	Simulimpresa/Practice Enterprise - MOOCs
AGENDA	Behavioural Change for the Green Deal	Vilnius Gedeminas Technical University (VILNIUS TECH): Lithuania	Lithuania, Estonia, Poland, Italy, Sri Lanka, Thailand	Submitted in 2013	Simulimpresa/Practice Enterprise - MOOCs

Note: compiled by authors

A crucial aspect of the training involves learning to manage specific roles through active participation. This experiential learning process aims to increase the motivational base of participants by fostering a cooperative climate. The perception of achievable work results, visibility of objectives and goals, and an apparent coherence between goals and methods are emphasized to enhance the learning experience. Furthermore, participants are encouraged to take daily responsibility for resolving real-world problems that may arise from customer or supplier interactions, or logistical issues such as postal delays. Lastly, the program underscores the importance of teamwork. Participants must collaborate effectively with their peers, learning to work in groups and contribute to collective goals. This collaborative approach facilitates the sharing of knowledge and skills and strengthens the participants' ability to function as part of a cohesive team. To be mentioned, with the position of the Grant Holder of the project PICASP, represented by the University of Chieti-Pescara, is the contribution of Europen-Pen, which manages the international network of Practice Enterprises, enrolled in the project as an Associate Partner with the Italian ICA, Central Institute of Archaeology.

This will be induced by the training and updating of teachers, tutors, and mentors from the entrepreneurial and managerial sectors to apply new didactical technologies such as Practice Enterprise (PE) and Massive Open Line Courses (MOOCs). To develop the didactical methodology of courses by multidisciplinary MOOC modules in Practice Management by Practice Enterprise for the preparation of teaching staff in condition to promote and manage courses oriented to the start-up of SMEs and to the modernization of the existing ones.

The Practice Enterprise teaching approach, translated into Italian as Simulimpresa, was introduced for the first time in Italy, in University Courses in 2002 at the Forlì Campus of the University of Bologna. It must be said that in these projects, although PICASP and AGENDA, the MOOCS approach was not applied. It was experimented in PICASP and AGENDA to prepare Teaching Staff and Mentors. These were most of the activities carried out for the PICASP Project in the UIB together with the Consortium of Partners, as represented in Table 4.

TABLE 4. PICASP Consortium Partners

No.	Country	Organization	Partners	
1	ITALY	University of Chieti Pescara UDA (Grant Holder)	UDA	EUROPEAN PARTNERS
2	ITALY	SERINAR	SERINAR	
3	POLAND	Universytet Warszawski	OBA	
4	LITHUANIA	Vilnius Gedeminias Technical University	VGTU	BENEFICIARY PARTNERS
5	KAZAKHSTAN	Caspian State University of Technologies and Engineering Named After Sh. Yessenov	CSUTE	
6	KAZAKHSTAN	University of International Business	UIB	
7	AZERBAIJAN	Azerbaijan Tourism and Management University	ATMU	
8	AZERBAIJAN	Khazar University Baku	KHAZAR	
9	AZERBAIJAN	MIRAS Association	MIRAS	
Ass. 1	LITHUANIA	JSC GET WEB	GetWeb	ASSOCIATE PARTNERS
Ass. 2	GERMANY	Europen- PEN	Europen	
Ass. 3	ITALIA	Central Institute for Archaeology	ICA	

Note: compiled by authors

The European Partners of PICASP participated in the project by sharing their know-how concerning the didactical innovation with a focus on Practice Enterprise and the collaboration of universities with the business environment. The beneficiary partners have received the support and expertise of European Partners. The Associate Partners do not have a budget but provide support and expertise in their specialized field of activities, for Europen, the Practice Enterprise, and ICA, the Cultural Heritage. The distribution of responsibilities among Work Packages (WPs) distinguishes roles between WP Responsible and WP Support according to the distribution in Table 5.

TABLE 5. PICASP Distribution of Work Packages

No.	Country	Institution	Acronym	WP Nr.	Type of WP	Role
1	Italy	University of Chieti Pescara UDA (Grant Holder)	UDA	WP5	Management	European Partners
2	Italy	SERINAR	SERINAR	WP4	Dissemination and Exploitation	European Partners
3	Poland	Universytet Warszawski	OBA	WP1	Preparation	European Partners
4	Lithuania	Vilnius Gedeminias Technical University	VGTU	WP2	Development	European Partners
5	Kazakhstan	Caspian State University of Technologies and Engineering Named After Sh. Yessenov	CSUTE	WP3	Quality Plan	Beneficiary Partners

6	Kazakhstan	University of International Business	UIB	WP3	Quality Plan	Beneficiary Partners
7	Azerbaijan	Azerbaijan Tourism and Management University	ATMU	WP1	Preparation	Beneficiary Partners
8	Azerbaijan	Khazar University Baku	KHAZAR	WP2	Development	Beneficiary Partners
9	Azerbaijan	MIRAS Association	MIRAS	WP4	Dissemination and Exploitation	Beneficiary Partners
Ass. 1	Lithuania	JSC GET WEB	GetWeb	-	Associate Partners	Associate Partners
Ass. 2	Germany	Europen-PEN	Europen	-	Associate Partners	Associate Partners
Ass. 3	Italy	Central Institute for Archaeology	ICA	-	Associate Partners	Associate Partners
Ass. 1	Lithuania	JSC GET WEB	GetWeb	-	Associate Partners	Associate Partners

Note: compiled by authors

Table 5 delineates the distribution of work packages (WPs) among the consortium partners of the PICASP project, categorized by country, institution, acronym, WP number, type of WP, and role within the project. This comprehensive distribution underscores the collaborative framework and delineates each partner's specific responsibilities and contributions. The consortium is divided into three main categories: European Partners, Beneficiary Partners, and Associate Partners. European Partners, comprising institutions from Italy, Poland, and Lithuania, are primarily responsible for the project's overarching management and strategic development. The University of Chieti Pescara (UDA), serving as the grant holder, leads WP5, which is focused on management, while SERINAR is responsible for WP4, which pertains to dissemination and exploitation. Universytet Warszawski and Vilnius Gedeminias Technical University (VGTU) are tasked with WP1 (Preparation) and WP2 (Development), respectively.

Beneficiary Partners, including institutions from Kazakhstan and Azerbaijan, play a crucial role in implementing the project's innovations and ensuring quality outcomes. The Caspian State University of Technologies and Engineering, named After Sh. Yessenov (CSUTE) and the University of International Business (UIB) are both responsible for WP3, which involves the quality plan. Azerbaijan's involvement is marked by the Azerbaijan Tourism and Management University (ATMU) handling WP1 (Preparation), Khazar University Baku managing WP2 (Development), and the MIRAS Association taking charge of WP4 (Dissemination and Exploitation). Although not assigned specific work packages, Associate Partners provide specialized support and expertise to the project. This group includes JSC GET WEB from Lithuania, Europen-PEN from Germany, and Italy's Central Institute for Archaeology (ICA). Their contributions are essential in providing auxiliary support and ensuring the smooth execution of project activities.

In summary, the distribution of work packages across the PICASP consortium partners highlights a well-structured and collaborative approach to achieving the project's objectives. The delineation of roles ensures that each partner contributes effectively according to their expertise, facilitating a cohesive and integrated effort towards enhancing educational methodologies and fostering university-business collaborations within the Caspian region. This structured collaboration promotes efficiency and enhances the potential for successful project outcomes through shared

responsibilities and collective expertise. The project has shown that despite the challenges, the integration of MOOCs and PEs can significantly enhance educational outcomes and university-business collaborations. Addressing the challenges head-on with strategic planning and collaboration has been critical to the project's success.

5. CONCLUSIONS

The PICASP Project has illuminated the potential of integrating Massive Open Online Courses (MOOCs) and Practice Enterprises (PEs) as innovative educational tools within the realms of university-business collaboration. This initiative focused on the Caspian region, providing significant insights into the evolving educational landscape influenced by global economic shifts and the dynamic interplay between developed and developing economies.

The project's findings underscore that MOOCs and PEs can significantly enrich students' educational experiences, effectively bridging the gap between theoretical knowledge and practical application. This is especially pertinent in today's rapidly changing business environment, where the ability to adapt and apply learned skills in real-world settings is invaluable. The enhanced engagement and improved employability of students, as evidenced by the project outcomes, affirm the value of these educational tools in cultivating a workforce ready to tackle contemporary challenges.

Moreover, the project reflects on the broader discourse in management education, highlighting the critical need for educational systems to evolve beyond traditional approaches. The integration of MOOCs and PEs addresses some criticisms of management education by offering a more eclectic and practical learning environment that prepares students to manage and lead in diverse settings.

However, the journey does not end here. While the project has made substantial strides, such programs' continuous development and refinement are essential to ensure they remain relevant and practical. This includes addressing technological, logistical, and pedagogical challenges that may arise, ensuring that these innovative educational tools continue to meet the needs of both students and the global market.

In closing, the PICASP Project stands as a testament to the potential of innovative educational methodologies in transforming learning landscapes. It offers a framework for other institutions to replicate and adapt, potentially influencing broader educational policies and practices. The success of such initiatives will ultimately depend on the sustained collaboration among educational institutions, businesses, and policymakers to foster environments where practical and theoretical knowledge converge to meet the exigencies of modern-day challenges. While the project has made substantial strides, continuous development and refinement of such programs are essential to ensure they remain relevant and practical. Future implementations can benefit from the lessons learned in the PICASP Project, including the importance of industry collaboration, robust quality assurance, and the provision of adequate infrastructure and training.

The success of the PICASP Project owes much to the dedication and expertise of numerous individuals. Special thanks are extended to the faculty and administrative staff of the University of Bologna and the University of International Business, Almaty, whose relentless commitment and collaborative spirit were indispensable. Additionally, gratitude is due to the various business partners whose engagement and support enriched the educational content and ensured its relevance to current industry needs. Lastly, the students' contributions, whose enthusiasm and feedback were crucial in refining the project's approach, are warmly acknowledged.

Their active participation and critical insights were key in shaping the practical components of the curriculum. The project's impact would not have been possible without the collective efforts of all stakeholders involved, highlighting the power of collaborative educational innovation.

AUTHOR CONTRIBUTION

Writing – original draft: Massimo Bianchi
Conceptualization: Massimo Bianchi.
Formal analysis and investigation: Massimo Bianchi.
Funding acquisition and research administration: Massimo Bianchi.
Development of research methodology: Massimo Bianchi.
Resources: Massimo Bianchi.
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Writing review and editing research: Massimo Bianchi.

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Examining Monetary and Non-Monetary Incentives for Public Servants in Kazakhstan: Empirical Evidence

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ABSTRACT

This study investigates the satisfaction of public servants in Kazakhstan with their current monetary and non-monetary incentives. A block of questions on these aspects of public service motivation is part of a significant study on Kazakhstani civil service transformation. Furthermore, the research paper determines public officials' commitment to financially tangible or intangible motivation tools. The theoretical part examines various aspects of motivation and its types and provides an overview of the state-of-the-art public service motivation theory. At the same time, the practical part reveals both general patterns at the country and organization level and individual characteristics of the civil servant's motivation. The survey was conducted within a month, from April 19 to May 20, 2023. About 10,942 representatives of central and local public authorities participated in the survey. The more significant share of respondents (41%) pointed to the "desire to be useful to the state" as one of the main goals of entering the public system and serving the people. At the same time, according to practitioners, the Top-3 issues resist the attraction and retention of public sector professionals. There are low wages (75%), motivation (55%), and lack of competency (45%) of civil servants. Based on the regression analysis results, the group of non-financial incentives received the most outstanding commitment compared to monetary motivation tools. Particularly, the social status and agency activities serve as a basis for further research and policy recommendations.

KEYWORDS: Motivation, Monetary Incentives, Non-Monetary Incentives, Public Service, Survey

SCSTI: 06.77.59

JEL Code: J24, J38, J45, M54

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1. INTRODUCTION

One of the pivotal aspects of the existing model of public service is its focus on citizens and their needs, as well as the cultivation and retention of professional personnel. Governments, as we know, play a critical role in providing public goods needed to support economic growth, such as health, education, infrastructure, and property rights – and the effectiveness of these services crucially depends on the performance of the people who deliver them (Bandiera et al., 2017). Public servants, therefore, are not just mere functionaries, but the very backbone of government operations. They play crucial roles in delivering public goods and services such as health, education, infrastructure, and property rights. The effectiveness of these services hinges on the performance and motivation of civil servants, making the topic of our study all the more significant.

The transformation of public service systems is a key priority for modern governments, aiming to enhance the efficiency and responsiveness of civil servants. This focus on optimizing public sector performance is particularly critical in developing nations like Kazakhstan, where the state apparatus plays a pivotal role in addressing economic and social challenges. The development of Kazakhstan is carried out in the context of several global and regional challenges that require restructuring and increasing the efficiency of the state apparatus. A necessary component of success is strengthening the human resources potential of the civil service (Agency for Civil Service Affairs, 2024). According to the Strategy Kazakhstan – 2050 and the Concept for the Development of Public Administration System until 2030, the main aim of further country development is the creation of a professional state apparatus for which serving the people and government is paramount. The legislation changes over the past two years contributed to the creation of a new model of the Kazakhstani civil service based on abilities and competencies, combining elements of career and position models (Agency for Civil Service Affairs, 2024). From January 1, 2024, government agencies completely switched to a new remuneration system based on grading and distribution of positions among functional blocks. Thus, the salary gap between employees of central and local authorities has been reduced. The flexible schedule mode continues, which was previously introduced due to COVID-19 restrictions.

Public service motivation matters when individuals choose to work in the civil service system. Besides the economic situation, cultural issues, and prestige of the public sector as an employer, the intrinsic reasons are highly significant. Although a series of contemporary research studies supports the effectiveness of different approaches to motivation in the public sector, the current literature does not fully disclose the study of similar issues in the public sector.

In general, there is currently a great need to study additional incentive tools for civil servants. Since financial measures are almost exhausted. Non-financial motivation measures are becoming increasingly crucial for further developing the civil service system.

Therefore, this research paper aims to analyze Kazakhstani civil servants' current monetary and non-monetary incentives based on empirical evidence from the survey conducted and to propose policy recommendations for further development of the public service motivation system. To address this aim, the solutions to the following research questions will be studied: “What motivation tools are public servants in Kazakhstan fully satisfied with? Moreover, what motivational factors do not significantly increase the efficiency and interest of public sector employees?” The in-depth analysis of existing theoretical research on public service motivation will be conducted based on the research questions. Moreover, the paper will examine the opinions of current civil servants regarding their satisfaction with the existing incentive package. The solution of these tasks and research problems will fully realize the public service's potential in attracting,

retaining, and increasing the efficiency of talented personnel.

2. LITERATURE REVIEW

In both the public and private sectors of developed countries, increasing emphasis is being placed on employee well-being. This encompasses physical and mental health, as well as financial well-being, all of which have direct impacts on employee engagement, performance, team spirit, and the organization's customer focus (Agency for Civil Service Affairs, 2023). There is a distinct difference in the motivation of employees in the private and public sectors concerning their desire to serve.

Motivation is defined as "the ability of people, institutions, and societies to perform functions, solve problems, and set and achieve objectives" (UNDP, 2006). In the context of the public sector, Public Service Motivation (PSM) is described as an individual's predisposition to respond to motives grounded primarily or uniquely in public institutions or organizations (Perry & Wise, 1990).

As a theoretical construct, motivation encompasses several key characteristics:

(1) Level of Perception: This includes system-wide, organizational, and individual levels.

(2) Financial Component: This is divided into monetary and non-monetary elements.

(3) Focus: This considers both intrinsic and extrinsic factors (UNDP, 2006).

These types of motivation are further delineated and illustrated in Figure 1, which categorizes various motivational drivers within these frameworks.

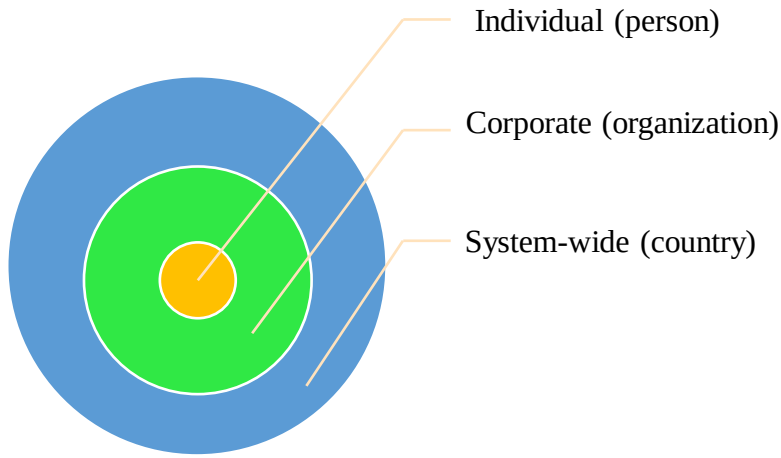

FIGURE 1. Types of motivation

Note: compiled by authors based on UNDP (2006)

For example, the incentives for individual motivation are pay, pension, allowances, accommodation, work environment, professional development, stability, job security, etc. Incentives for organizational motivations are organizational climate, rewards practices, degree of autonomy, etc. The system-wide incentives include security, investment climate, societal values, culture and rule of law (Steers & Porter, 1987; UNDP, 2006). These diverse levels of incentives illustrate the multifaceted nature of motivation within different contexts. Understanding and addressing these varied incentives can lead to more effective strategies for enhancing both individual performance and overall organizational productivity.

Besides this, the following categories represent the motivational tools (Table 1).

TABLE 1. Types of Incentives

Monetary	Non-Monetary	Internal	External
- Pay; - Pensions; - Insurance; - Clothing, accommodation allowance; - Travel allowance; - Child care allowance; - Subsidised meals/clothing/ accommodation; - Subsidised transport; - Child care subsidy.	- Holiday/vacation; - Flexible working hours; - Access to/support for training and education; - Sabbatical, study leave; - Planned career breaks; - Occupational health/counseling; - Recreational facilities.	- Decision rights (autonomy); - Accountability; - Market exposure (risk); -Financial responsibility.	- Governance (responsibility for decisions and control over residual income); -Financing directed toward public policy objectives; -Control mechanisms (the degree to which regulations or financial incentives are necessary to obtain desired policy objectives).

Note: compiled by authors based on Adams & Hicks (2000), UNDP Global Centre for Public Service Excellence (2013)

The issue of motivation in the public sector is an insufficiently studied topic, as extensively discussed by Cacioppe and Mock (1984), and Homberg and Vogel (2016). Effective public service delivery in developing countries ultimately depends on the performance of public sector workers. Notably, it has been found that civil servants in developing countries are often paid better than their counterparts in the private sector. However, evidence suggests that poor government performance in these countries is not solely due to underpayment of government workers (UNDP, 2006).

A substantial body of research in public administration emphasizes that incentives must be pilot-tested and tailored to specific contexts (Perry & Hondeghem, 2008; UNDP, 2013; Yung, 2014; Harari et al., 2016). Both monetary and non-monetary incentives can be applied, considering budget constraints, the historical development of the country, and the nature of the organization and individuals involved. Civil servants are more likely to be productive if they receive intrinsic rewards (Perry & Hondeghem, 2008). At the same time, the state has a vested interest in employing cost-effective non-financial motivational instruments (Adams & Hicks, 2000; Bandiera et al., 2017).

Public Service Motivation (PSM) is defined as a type of motivation unique to the public sector, though it does not encompass all motives within this sector (Perry & Hondeghem, 2008). This concept emerged in the 1980s as a way to explain the different reward preferences among public and private sector managers (Rainey, 1982). Over the past two decades, the body of academic research on public service motivation has grown significantly. Perry and Wise (1990) later defined PSM as an individual's predisposition to respond to motives grounded primarily or uniquely in public institutions. Empirical evidence on public service motivation has been provided by various scholars, including Perry and Wise (1990), Bozeman (2015), Ritz, Brewer, and Neumann (2016), and Asseburg (2020).

These studies identify specific motivational factors, which are broadly categorized as financial and non-financial, as well as intrinsic and extrinsic motivational effects. The combination of various incentive tools is designed to attract competitive talent and motivate them to achieve high performance in

the public sector. Recognizing human capital as one of the most important assets of civil service organizations, researchers like Yung (2014) and Belle & Cantarelli (2015) have linked effectiveness to motivation. Motivation exhibits flexibility, which manifests in two dimensions: altering the set of incentive tools and changing the performance of the individuals to whom the incentive package is directed. The long-standing notion that people are motivated to work in public service out of altruism, a desire to serve, or a wish to impact society remains significant.

The concept of Public Service Motivation (PSM) was introduced in the last few decades of the previous century and has since expanded across various academic disciplines. Recent research has increasingly focused on non-monetary incentives in the public sector (Asseburg & Homberg, 2020; Vandenabeele & Schott, 2020; Zubair et al., 2021; Rollnik-Sadowska et al., 2023; Lee & Na, 2024). Particular emphasis has been placed on aspects such as self-realization within the organization and on a system-wide scale. Additionally, there is significant attention to employees' commitment to organizational goals and values. The importance of social support and organizational development has been underscored, especially in light of lessons learned from the COVID-19 pandemic.

In summary, numerous theories on public service motivation exist, which are both integrated and complementary. The concept is crucial because it relates to the interest in working in the public sector and to performance outcomes. However, comprehensive research integrating different aspects of public service motivation remains limited. Preliminary evidence suggests that both monetary and non-monetary factors should be analyzed in depth, considering the historical and cultural background of the country and involving current public officials as the study population. A notable characteristic of recent research on public service motivation is its focus on identifying the most effective non-monetary policy instruments specific to each country. This focus is due to the unique cultural, national, ethical, and other aspects of each country. Moreover, economic crises and global challenges in recent years have driven studies to seek non-budgetary and non-monetary motivation tools. Such case studies not only help develop specific solutions for government agencies but also provide insights into foreign policy-making challenges and successes.

In Kazakhstan, this topic has been relatively underexplored in the context of public service. Often, practitioners in the public sector are ahead of domestic theoretical developments because strategic directions are already embedded in the country's program documents. Consequently, civil servants must learn as they make policy decisions. This study aims to support domestic research to unlock the potential of motivational tools for civil servants.

2. METHODOLOGY

This research employed a quantitative method involving a survey conducted among 10,942 civil servants in Kazakhstan, representing approximately 12% of the total population. The study was conducted across all regions of Kazakhstan, encompassing both central and local administration, from April 19 to May 20, 2023. Data collection utilized Google Forms, enabling participants to respond to the survey questions via computers and mobile devices. Upon reaching the desired sample size, the survey was closed, and the data from Google Forms was imported into Excel for coding and preparation for analysis and interpretation. Stata software was subsequently used for data analysis.

The research design comprises three core aspects:

(1) Descriptive Statistics: Based on the survey respondents' profiles.

(2) Primary Results of Data Analysis: Examining three motivation levels—country, organization, and individual levels.

(3) Regression Analysis Outcomes: Describing civil servants' satisfaction level with current incentives.

By operationalizing three aspects, the study described the profile of participating civil servants at the first stage. Secondly, respondents were asked to think about reasons for entering the civil service (the country level) and to assess the Top-3 issues during their performance (organization level). Moreover, by applying regression analysis, the study examines the commitment of civil servants to monetary or non-monetary incentives.

The following conditions were assumed to be true:

(1) population was of adequate size to provide valid and comprehensive questionnaire responses;

(2) respondents completed the questionnaire accurately and honestly;

(3) the 10-point Likert scale questions in the survey measure the degree of utilization of monetary and non-monetary incentives in the public authority.

The principal statistical methodology used to test the hypotheses is multiple regression analysis. This technique enables us to assess whether there are causal relationships between several independent variables and a single dependent variable (Venter & Maxwell, 2000).

To construct a multiple regression model, the variable 'Assessing the current level of the civil service' was used as the dependent variable. The following variables were employed as independent predictors:

1. *Satisfaction with Wages*: Reflecting the adequacy of financial compensation provided to civil servants.

2. *Satisfaction with Working Conditions:* Encompassing the availability of essential resources such as a workplace, computer, internet access, office supplies, and communication technologies.

3. *Satisfaction with Team Atmosphere*: Capturing the quality of interactions with colleagues and relations with management within the workplace.

4. *Satisfaction with Work Schedule:* Evaluating the flexibility and suitability of the work schedule within government agencies.

5. *Opportunities for Career Growth:* Assessing the existence and accessibility of pathways for professional advancement within the civil service.

6. *Social Status of Civil Servants in Kazakhstan:* Reflecting civil servants' societal standing and recognition.

7. *Income Level of Civil Servants:* Indicating the financial resources available to civil servants in Kazakhstan.

The main goal of running the regression was to understand how nonmonetary and monetary incentives influence public servants' motivation.

The following hypotheses are formulated to address the research questions:

H0: The group of monetary incentives (salary, income level) will have more influence on public officials' commitment to civil service;

H1: The group of non-monetary incentives (agency activities, condition, environment, schedule, career, social status) will have more influence on public officials' commitment to civil service.

3. FINDINGS AND DISCUSSIONS

4.1 Descriptive Statistics

As of January 1, 2024, the regular number of civil servants was 90 583, the actual number was 83 009 people. The share of women in the civil service remains stable and amounts to 55.7% (in 2022 – 55.5%, in 2021 – 55.7%, in 2020 – 55.5%). The average age of civil servants is 40 years. In general, today the civil service is characterized by stability and a low level of turnover. In 2023, the share of net turnover was 4.9% or 4 385 people (in 2022 - 4.7%, in 2021 - 6.2%, in 2020 - 5%).

The survey was conducted among 10 942 civil servants. The profile of the participants is presented in Table 2.

According to the table above, most respondents were women (63.7%). The average age was 39. About 83.1% of participating civil servants have bachelor's degrees. About 4/5 of the participants work in an executive position (leading specialist, chief specialist) at local public authorities.

TABLE 2. Profile of survey respondents

Parameter	Mean	Number	Share, %
Gender	Male	3968	36.3%
	Female	6974	63.7%
Age	20-30	2570	23.5%
	31-40	3800	34.7%
	41-50	2704	24.7%
	More than 51	1868	17.1%
Education	Secondary school graduate	12	0.1%
	College Graduate	865	7.9%
	Bachelor degree	9095	83.1%
	Master's degree	898	8.2%
	PhD	72	0.7%
Occupation	Executive position	8965	81.9%
	Managerial position	1913	17.5%
	Other	64	0.6%

Note: compiled by authors based on survey results

4.2 Primary results

If we consider the system-wide and organization level, human capital is undoubtedly one of the important foundation elements in building an effective public service. Based on the survey results, the respondents pointed out three key issues of the modern system, such as:

- low level of remuneration (75%);
- low level of motivation (55%);
- lack of competency (45%).

Thus, the issue of staff motivation is the second most important unresolved issue for civil servants. At the same time, the key areas for civil service system development, according to respondents, are described in Figure 2.

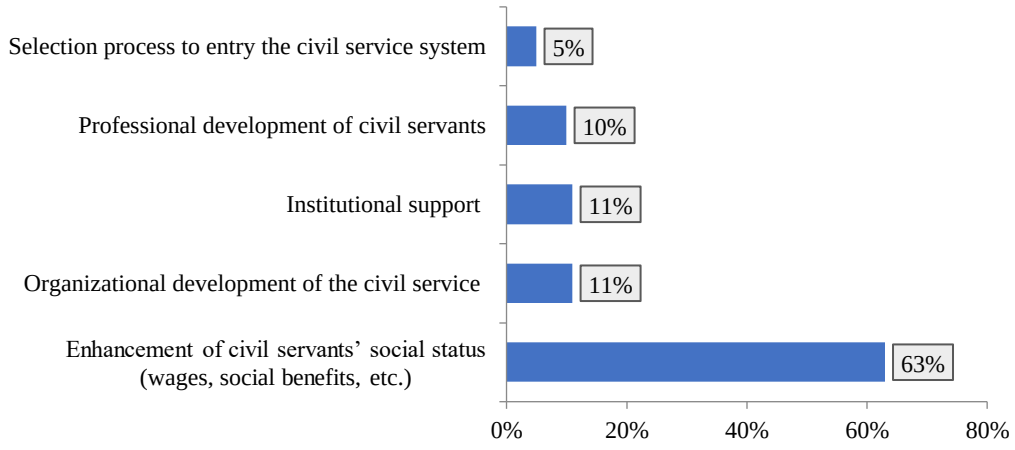

FIGURE 2. Main directions for further improvement of the civil service system

Note: compiled by authors

At the individual level, the respondents identified Top-5 reasons to enter the civil service, such as: 41% cited the desire to be useful to the state; 27% mentioned financial stability; 15% aimed to gain professional experience; 12% sought a career growth and promotion; 5% were motivated by establishing professional connections, obtaining additional benefits (such as housing, land, money), or due to the desire of parents or relatives.

According to the Agency for Civil Service Affairs (2023), the primary factor influencing employee motivation and satisfaction is the financial component. Specifically, 72.2% of employees assessed their financial situation as average (77% of managers and 71% of executives), 6.8% assessed it as above average (9% of managers and 6% of executives), and 21% assessed it as below average (15% of managers and 23% of performers).

Despite the introduction of a new remuneration system, only 11.8% of respondents believe that their wages are sufficient to provide financial support for their families. Consequently, there is a high level of debt among civil servants (over 90%). Additionally, providing housing for civil servants remains a significant issue, with approximately 40% of employees lacking their own housing.

4.3 Regression analysis

Motivation, defined as the ability of people, institutions, and societies to perform functions, solve problems, and set and achieve objectives (UNDP, 2006), serves as a critical determinant of individuals' commitment to their roles within civil service. In this study, we run a regression model to investigate the extent to which satisfaction with both monetary and non-monetary incentives influences civil servants' overall assessment of the state of the civil service in Kazakhstan, encompassing reforms, civil servant status, objective attainment, and policy implementation. This assessment serves as a proxy for civil servants' motivation to engage in public service.

The regression analysis provided compelling insights into the factors driving public service motivation within the studied context (Table 2).

TABLE 2. Motivation in Civil Service: Understanding the Impact of Monetary and Non-Monetary Incentives

Public_Service_Level	**Coefficient**	**P>|t|**
_cons	1.081328	0.000
Agency_Activities	.2102982	0.000
Salary	.0538663	0.005
Condition	.1151729	0.000
Environment	.0091893	0.686
Schedule	.0622452	0.002
Career	.1227616	0.000
Social_Status	.3200081	0.000
Income_Level	.1986111	0.000
Statistical Significance and Model Fit: Number of observations (n) = 10,878 F-statistic = 1106.12 ($p < 0.0001$) R-squared = 0.4484		

The analysis demonstrates a high degree of statistical significance, with the model achieving an F-statistic of 1106.12 ($p < 0.0001$), indicating that the predictor variables collectively contribute significantly to explaining the variance in public service motivation. The R-squared value of 0.4484 suggests that the independent variables included in the model explain approximately 44.84% of the variability in public service motivation.

Our findings highlight the multifaceted

nature of motivation among public servants, demonstrating that monetary and non-monetary incentives are critical determinants of their attitudes toward public service. Specifically, agency activities and social status emerged as the most influential factors in enhancing public service motivation, followed by income level, career opportunities, and working conditions. While salary also positively impacted motivation, its effect was comparatively minor. Interestingly, environmental factors did not show a significant influence on motivation within this context.

Overall, these results highlight the importance of considering financial and non-financial incentives to motivate public servants effectively. The strong impact of non-monetary factors such as social status and agency activities suggests that policies focusing on these areas could be particularly effective in fostering motivation and commitment among civil servants. This comprehensive understanding of motivational drivers can inform the development of targeted strategies to enhance public service performance and employee satisfaction.

Monetary Incentives

Our regression analysis revealed that monetary factors significantly influence public service motivation among civil servants. Specifically, salary and income level emerged as statistically significant predictors of public service motivation.

Salary: The coefficient for salary (0.0538663, $p = 0.005$) indicates that for every unit increase in salary, there is a corresponding increase of approximately 0.0539 units in public service motivation, holding other variables constant. This suggests that higher salaries are associated with greater motivation among public servants, highlighting the importance of competitive financial remuneration in attracting and retaining talented individuals within civil service.

Income Level: Similarly, the coefficient for income level (0.1986111, $p < 0.0001$) suggests that higher income levels are positively associated with public service motivation. For every unit increase in income level, we observe a corresponding increase of approximately 0.1986 units in public service motivation. This finding underscores the significance of broader socioeconomic factors in shaping individuals' attitudes toward public service.

Non-Monetary Incentives

In addition to monetary factors, our analysis identified several non-monetary incentives that significantly influence public service motivation among civil servants.

Agency Activities: The coefficient for agency activities (0.2102982, $p < 0.0001$) indicates that individuals who are more actively engaged in agency activities exhibit higher levels of public service motivation. This highlights the importance of meaningful engagement and involvement in organizational initiatives to foster a sense of purpose and commitment among public servants.

Working Conditions: A positive coefficient for working conditions (0.1151729, $p < 0.0001$) suggests that favorable working conditions enhance public service motivation. Factors such as a supportive work environment, adequate resources, and a conducive organizational culture are instrumental in fostering job satisfaction and motivation among civil servants.

Schedule Flexibility: The coefficient for schedule flexibility (0.0622452, $p = 0.002$) indicates that individuals with greater schedule flexibility demonstrate higher levels of public service motivation. This underscores the importance of work-life balance and autonomy in promoting job satisfaction and commitment among public servants.

Career Advancement Opportunities: A positive coefficient for career advancement opportunities (0.1227616, $p < 0.0001$) suggests that career growth and development prospects are significant drivers of public service motivation. Providing avenues for professional advancement and skill development is crucial for attracting and retaining talented individuals within civil service.

Social Status: The coefficient for social

status (0.3200081, $p < 0.0001$) indicates that individuals with higher social status exhibit more significant levels of public service motivation. This highlights the role of social recognition and prestige in shaping individuals' attitudes towards public service roles.

Environmental Factors: Interestingly, the predictor variable "environment" did not significantly correlate with public service motivation ($p = 0.686$). While environmental factors such as organizational culture and leadership may influence overall job satisfaction, our results suggest that they may not directly impact individuals' intrinsic motivation to serve the public.

Overall, the H0-hypothesis is rejected and H1-hypothesis is justified. Thus, the group of non-financial incentives is more significant for civil servants' commitment to the public sector compared to monetary motivation tools. Moreover, among the non-monetary incentive tools, social status and agency activities have the most significant influence.

5. CONCLUSIONS

The study examined the effectiveness of monetary and non-monetary incentives for public servants in Kazakhstan, highlighting significant findings that have important implications for policymakers and organizational leaders. An analysis of the well-being of civil servants showed the relevance of the motivation issue. At the same time, when implementing specific measures in this area, it is necessary to consider the state's current economic situation. Monetary and non-monetary stimulation should be rational depending on the intended effect and the subject to whom it is directed.

According to survey results and regression analysis outputs, the H1 hypothesis is justified. Therefore, the social status of civil servants and agency activities (non-monetary incentives) have received the most excellent support among respondents. The non-monetary incentives could provide cost-effective solutions for civil servants. The Agency for Civil Service Affairs achieved significant results (pool of talents, competition for the best civil servant, etc.). Besides this, the study shows that despite implementing a new remuneration system, civil servants also need other financial support (for example, increasing the number of medical benefits).

These findings have important implications for policymakers, organizational leaders, and human resource practitioners tasked with managing and incentivizing public servants. By understanding the diverse factors influencing public service motivation, stakeholders can tailor strategies to attract, retain, and engage talented individuals committed to serving the public good. This may include implementing competitive salary structures, enhancing working conditions, providing opportunities for career advancement and skill development, and fostering a supportive organizational culture that values and recognizes the contributions of public servants.

Possible in-depth analyzes among non-monetary sources of motivation serve as directions for further research on this topic. Namely, tools and policy decisions to improve the social status of civil servants, as well as involvement in government agency activities, will increase civil servants' motivation.

Further research should delve deeper into non-monetary sources of motivation, exploring specific tools and policy decisions to improve the social status of civil servants and their involvement in agency activities. Additionally, understanding the cultural and historical context of motivation in the public sector can provide more tailored and effective solutions.

AUTHOR CONTRIBUTION

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Kazakhstan Economy Sustainable Development:Trade Dynamics Impact

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ABSTRACT

The relevance of this study is underscored by the critical role of foreign trade in Kazakhstan's national economy, particularly in agricultural and livestock products. This research aims to comprehensively analyze the relationship between exported and imported agricultural and livestock product quantities and their respective USD values. The methodology employed includes regression analysis of Kazakhstan's trade data spanning from 2018 to 2022, focusing on evaluating these relationships' statistical significance and strength. This study's main findings underscore the audience's crucial role in implementing the study's recommendations. Import and export volumes have a profound impact, with particularly strong effects observed in the food and livestock sectors. While the export volumes of agricultural products do not significantly influence their trade values, import volumes exhibit a strong correlation. These insights emphasize the necessity for the audience's involvement in multifaceted approaches in trade policy and strategy development to foster sustainable economic growth in Kazakhstan. The study's recommendations for revising and optimizing trade strategies can enhance the efficiency and resilience of the national economy, improve policy-making and economic planning, and leverage these insights better to understand the dynamics of Kazakhstan's trade activities. The findings advocate for strategic investments in trade infrastructure, diversification of the export base, and fostering an attractive investment climate to leverage the benefits of increased trade turnover for sustainable economic development. This comprehensive approach will ensure Kazakhstan's robust integration into the global market, fostering long-term economic resilience and growth.

KEYWORDS: Sustainable Development, Economy, Import, Trade, Kazakhstan

SCSTI: 06.71.35

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1. INTRODUCTION

Globally, trade is a vital component of economic development, serving as a primary engine of growth for both developed and developing nations. The exchange of goods and services across borders enables countries to access resources that are scarce domestically, optimize production efficiency, and stimulate innovation and technological advancement. Exports bring in foreign exchange, boost national income, and create jobs, while imports provide consumers and businesses with a broader range of products and services, fostering competition and lowering prices. In an increasingly interconnected world, the health of a nation's economy is closely tied to its ability to engage effectively in global trade.

Kazakhstan, a major Central Asian player, holds a significant position in global trade. According to the World Trade Organization (WTO), Kazakhstan ranks among the top 60 countries worldwide regarding export volume. The country is rich in natural resources, with substantial oil, metals, and agricultural exports. The importance of trade, both imports and exports, cannot be overstated for the national economy, as it influences economic growth, employment, and overall development. Understanding trade dynamics is crucial for policymaking, strategic economic planning, and sustaining growth in an increasingly competitive global market.

International trade plays a crucial role in the global economy. Leaders in export and import, such as China, the USA, Germany, Japan, and South Korea, significantly influence global trade flows. China is the largest exporter and importer, leading in trade volumes of goods and services. The USA follows in second place, while Germany is third, specializing in high-tech goods and automobiles. Japan and South Korea are also prominent due to their strong positions in technology and industrial production.

Kazakhstan's ties with these nations are vital for its economy. China is one of Kazakhstan's largest trading partners, importing oil, metals, and agricultural products, and exporting machinery, equipment, and consumer goods. The USA is crucial for energy and metal exports. Trade with Germany, Japan, and South Korea involves importing high-tech products and industrial equipment, aiding in the modernization of Kazakhstan's industry.

These connections boost Kazakhstan's export growth, attract investments, and develop key sectors, highlighting the importance of its integration into the global economy and strengthening trade relations with world leaders.

Import and export activities are vital to Kazakhstan's economic development. Exports bring in foreign currency, improve the trade balance, and stimulate local production, while imports provide access to essential goods and services that may not be available domestically. This trade balance impacts the country's overall economic health, affecting inflation rates, employment levels, and GDP growth. Effective trade policies can help Kazakhstan leverage its resources, enhance its global market presence, and attract foreign investments, contributing significantly to sustainable economic development.

The primary objective of this research is to comprehensively analyze the relationship between the quantities of agricultural and livestock products traded (both exports and imports) and their respective USD values. This involves investigating how variations in trade volumes influence the economic value of these products, thereby providing insights into the critical factors that determine trade values in

Kazakhstan. The study aims to inform and enhance trade policies by understanding these dynamics, contributing to sustainable economic development and strategic economic planning in Kazakhstan.

2. LITERATURE REVIEW

The agricultural and livestock sectors play a significant role in Kazakhstan's economy, contributing to national income, employment, and trade balances. Various studies have highlighted the importance of these sectors and examined the factors influencing their economic impact on export and import activities.

Some studies showed that logistics and transport costs are crucial in international trade. Gani (2017) focused on the logistics performance effect in international trade and revealed that improvements in logistics infrastructure, customs efficiency, and transport services significantly enhance trade volumes. Lun et al. (2016) analyzed the economic impact of transport complex economies and highlighted that well-developed transport systems reduce transportation costs and improve logistics operations, stimulating international trade. Both Gani (2017) and Lun et al. (2016) emphasize the importance of logistics performance and transport systems in enhancing trade. Nordås and Rouzet (2017) studied the impact of services trade restrictiveness on trade flows and found that reducing regulatory barriers leads to a significant increase in trade volumes. Nordås and Rouzet (2017) focused on regulatory barriers in the services sector, providing a complementary perspective on trade facilitation. Martínez-Zarzoso et al. (2003) examined the determinants of transport costs in the Spanish ceramic sector and demonstrated that infrastructure improvements can significantly reduce transport costs and boost trade activities. Martínez-Zarzoso et al. (2003) provide a detailed quantitative analysis of transport costs, reinforcing the importance of infrastructure in reducing trade barriers.

Majority of studies demonstrated the importance of integrating economic and regulatory perspectives to develop comprehensive strategies for enhancing the sustainability and resilience of agricultural systems and trade networks (Fiksel, 2006; Borsellino et al., 2020). In examining the impact of agricultural and livestock products on the national economy, Enahoro et al. (2014) focused on the economic impacts of livestock trade and revealed that it significantly boosts the economies of developing countries by increasing income and employment opportunities. Verburg et al. (2009) studied the effects of livestock agriculture on land use and emphasized the trade-offs between economic benefits and environmental sustainability, advocating for balanced approaches that consider both economic and ecological outcomes. Ercsey-Ravasz et al. (2012) analyzed the complexity of the international agro-food trade network and its impact on food safety. Using network analysis, they identified critical nodes and pathways in global food trade, highlighting how these networks can facilitate the spread of contaminants but also improve food safety through better regulation and monitoring. Smith and Swain (2010), Meyers et al. (2012) and Rogachev, et al. (2015) examined the economic mechanisms for managing food security within the "production-consumption-import" system in Russia. They used indicators such as food production, consumption norms, and food imports to assess the state of food security and concluded that Russia suffers from chronic food shortages and high import dependence. They suggest that forming agricultural clusters and growth poles can enhance food security by improving local agricultural production. Popescu (2022) investigated the importance of production and import for food security in Romania from 2015 to 2020 and found that although production increased for some products like fruits and meat, imports were still necessary to meet market needs. Romania relies on imports due to insufficient domestic production, especially for fish and sugar. Mancini et al. (2023) found that the export and import of food products affect the social sustainability of food systems. Social

issues are most acute in products such as rice, fruits, vegetables, and livestock products, primarily in India, Argentina, and other non-EU countries.

Other studies employed forecasting methods, in analyzing trade dynamics and can be effectively applied across various analytical approaches, making forecasting a versatile and essential tool in this field. Recent methodologies in trade analysis have brought significant advancements. Wang and Lee (2012) used fuzzy time-series models to outperform traditional ARIMA models in short-term forecasting of Taiwanese exports, demonstrating higher accuracy. Similarly, Xiao, Gong, and Zou (2009) applied fuzzy soft sets combined with forecasting accuracy criteria to enhance predictions for the Chongqing Municipality, showing robustness in specific datasets.

Veenstra and Haralambides (2001) employed multivariate autoregressive time-series models to minimize forecast errors for long-term seaborne trade estimations, using key commodity markets as independent variables. In another study, Lu et al. (2020) utilized machine learning techniques, including CEEMDAN for data denoising, to predict carbon trading volumes and prices in China, highlighting the versatility of these methods.

Overall, forecasting methods, whether traditional or modern, provide valuable insights into trade dynamics and can be effectively applied across various analytical approaches, making forecasting a comprehensive and essential tool in this field.

3. METHODOLOGY

Export and import activities are vital components of a nation's economy, driving economic growth, employment, and technological advancement. They facilitate access to foreign markets, allowing countries to capitalize on their comparative advantages. mports bring necessary goods and services that may not be available domestically, thus supporting local industries and consumer needs. The balance between export and import values significantly impacts the trade balance, influencing national economic stability and growth. A thorough literature review was conducted to identify the key indicators influencing export and import values.

The data preparation process involved several key steps. Data collection involved compiling data about export and import quantities and values expressed in USD across various product categories, including crop production, food products, livestock production, and services. Data cleaning involved the elimination of duplicate entries, the management of missing values, and the assurance of data consistency. The normalization step included converting all data values into a uniform format for precise comparison and analysis. Finally, the data were summarized by year and product category to facilitate the analysis of trends over time.

The indicators are provided as a regression tree to give a clear picture of selected data justification in Figure 1.

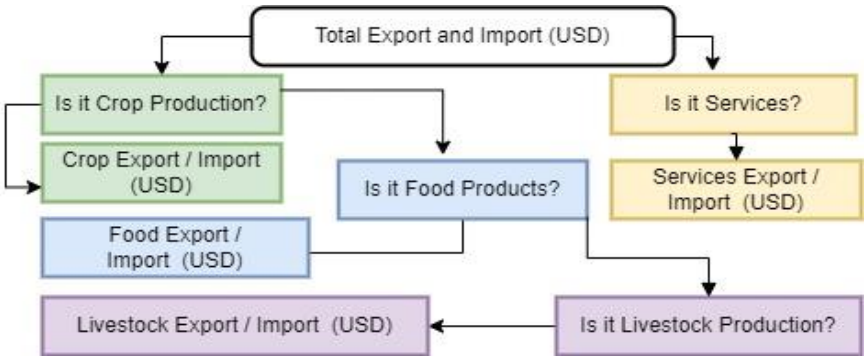

FIGURE 1. Indicators of the research

Note: complied by authors

The chosen indicators in the regression tree diagram are selected to clearly understand the USD values of exports and imports, considering both the volume of goods and services and their monetary value. The diagram categorizes the total export and import values (USD) into four segments: crop production, food products, livestock production, and services. The primary node represents the total export and import values in USD, summarizing the overall economic impact of trade. From this primary node, the tree branches into crop production or services, distinguishing between tangible goods and intangible services.

The "Is it Crop Production?" branch leads to crop exports and imports (USD). Crop production, measured in tons and USD, represents agricultural trade, which is crucial for food security and economic stability.

The "Is it Food Products?" branch splits into food exports and imports (USD). This category includes processed food items, which are essential for understanding consumable trade and how they affect market prices and supply chains.

The "Is it Livestock Production?" branch leads to livestock exports and imports (USD). Livestock production covers animal products, impacting domestic consumption and export markets, food security, and rural livelihoods.

The "Is it Services?" branch directs to services export and import values (USD). The services sector, including transportation, financial services, and IT, contributes to GDP and employment in the global economy.

Each node in the regression tree is justified by its role in providing a detailed view of trade. The correlation and regression analyses validate these indicators, showing their relationships. The dependent variable is the USD value of exports and imports. In contrast, the independent variables include the quantities of goods (in tons) exported and imported and factors like commodity prices and global economic conditions.

Overall, the chosen indicators and their relationships in the regression tree offer a framework for analyzing trade values and understanding the factors driving economic activity in international trade.

Correlation and Regression Analysis. A correlation and regression analysis were conducted to understand the indicators' relationships further. Dependent Variable (The USD value of exports and imports). Independent Variables (The quantity of goods (tons) exported and imported, along with other factors such as commodity prices and global economic conditions). The correlation analysis provided insights into the strength and direction of the relationships between the variables. In contrast, the regression analysis quantified the impact of the independent variables on the dependent variable.

We focused on data from 2018 to 2022 to capture recent and relevant trends in Kazakhstan's livestock and crop production, as well as export and import of services. This period provides the most current information, reflecting the latest economic developments and ensuring data consistency for accurate analysis. Livestock and crop production data from 2018 onward offer a comprehensive view of the agricultural sector's performance. Export and import data for services up to 2022 provide insights into the increasingly significant services sector, including transport, travel, and business services. The selected period encompasses significant events, such as the COVID-19 pandemic, which affected global trade dynamics. Analyzing this timeframe helps us understand the impact of these events on Kazakhstan's trade patterns. Using a consistent data period ensures comparability across sectors, crucial for accurate regression analysis and forecasting. Standardizing the timeframe to 2018-2022 maintains the integrity and reliability of the analysis.

4. FINDINGS AND DISCUSSION

The analysis of Kazakhstan's foreign trade from 2018 to 2022 revealed significant trends and relationships between the volumes of exported and imported agricultural and livestock products and their respective USD values. The data indicates a steadily increasing trade turnover, positively contributing to the national economy. While export volumes do not significantly impact their trade values, import volumes exhibit a strong correlation. These findings highlight the necessity for further development and optimization of trade strategies to foster sustainable economic growth in Kazakhstan.

In Table 1, there is provided information on the foreign trade turnover in Kazakhstan for the period 2018-2022.

The foreign trade turnover (FTT) analysis reveals significant insights into the dynamics of trade activities over the period from 2018 to 2022.

TABLE 1. Foreign Trade Turnover Analysis

Indicator	2018	2019	2020	2021	2022	Moving Average
FTT (USD)	94 769.7	97 774.9	86 469.9	101 736.4	135 527.4	103 055.66
FTT (% to previous year)	121.3	103.2	88.4	117.7	133.2	112.76
FTT Export (USD)	61 111.2	58 065.6	47 540.8	60 321.0	84 593.1	62 726.34
FTT (% to previous year, export)	126.0	95.0	81.9	126.9	140.2	113.98
FTT Import (USD)	33 658.5	39 709.3	38 929.1	41 415.4	50 934.4	40 929.34
FTT (% to previous year, import)	113.7	118.0	96.4	106.4	123.0	111.50

Note: compiled by authors based on Bureau of National Statistics (2022)

The moving average of 103,055.66 USD indicates a consistent increase in foreign trade turnover, suggesting an overall expansion in trade activities that positively contributes to the national economy. The year-over-year percentage change in FTT, with a moving average of 112.76%, underscores a steady growth trend in trade turnover, highlighting the robustness and resilience of the trade sector.

Examining the export component, the moving average of 62,726.34 USD denotes a steady increase in export values, reflecting a growing demand for the country's exports. This trend is further supported by the export growth rate, with a moving average of 113.98%, indicating consistent expansion in export activities and underscoring their positive economic impact. Conversely, the import analysis shows a moving average of 40,929.34 USD, illustrating an upward trend in import values and indicating rising domestic demand for foreign goods. The import growth rate, with a moving average of 111.50%, further demonstrates steady growth in import values, reflecting a healthy and sustained demand for imports.

The data points to a robust trade sector, with export and import activities showing positive trends. The consistent year-over-year growth in both components underscores the expanding nature of trade activities, contributing positively to the national economy. This comprehensive analysis clearly indicates the sustained growth and resilience of the foreign trade sector, which plays a critical role in the country's economic landscape.

The crop production (CP) exports and imports analysis reveals significant trends and potential underlying factors influencing these movements. The moving average of 9,002,070.2 tons for CP exports indicates a declining trend in export quantities, which may be attributed to changing agricultural practices or external market conditions. However, the

increasing trend in the monetary value of CP exports, with a moving average of 2,220,311.1 USD, suggests that the value per unit of crop exports is rising, potentially due to higher prices or improvements in product quality.

In Table 2, there is provided information export and import of agricultural products in Kazakhstan for the period 2018-2022.

TABLE 2. Export and Import of Agricultural Products

Indicator	2018	2019	2020	2021	2022	Moving Average
CP (tons) Export	10 003 657.5	9 358 408.1	8 322 216.4	8 098 601.7	9 227 470.4	9 002 070.2
CP (USD) Export	1 850 005.4	1 994 459.6	1 950 023.7	2 236 820.9	3 070 245.9	2 220 311.1
Crop Production (tons) Import	1 401 774.7	1 709 015.2	2 198 915.9	3 025 265.4	3 889 346.2	2 444 063.5
CP (USD) Import	10 003 657.5	9 358 408.1	8 322 216.4	8 098 601.7	9 22 ,470.4	9 002 070.2
CP (tons) Export	1 850 005.4	1 994 459.6	1 950 023.7	2 236 820.9	3 070 245.9	2 220 311.1
Export FP (tons)	4 555 476.8	4 085 734.0	4 321 570.9	3 612 020.7	5 172 506.1	4 349 461.7
Export FP (USD)	1 366 156.3	1 344 648.6	1 505 903.5	1 517 083.5	2 583 626.5	1 663 083.7
Import FP (tons)	7 386 370.9	7 585 738.5	6 874 347.3	7 588 514.8	7 616 558.7	7 410 706.0
Import FP (USD)	3 094 577.2	3 335 768.3	3 442 773.8	4 030 605.3	4 779 944.4	3 736 733.8
LP, Export (tons)	95 068.8	115 483.5	55 018.2	101 906.7	74 083.6	88 712.2
LP, Export (USD)	108 114.8	180 213.0	81 842.8	153 968.6	176 002.6	140 828.4
LP, Import (tons)	68 473.7	98 042.1	9 396.9	99 180.6	85 405.6	89 499.8
LP, Import (USD)	189 221.5	295 093.5	272 669.0	304 115.8	287 750.4	269 370.0

Note: compiled by authors based on Bureau of National Statistics (2022)

In contrast, the import side presents a different scenario. The moving average of 2,444,063.5 tons for CP imports reflects a significant increase in import quantities, indicating a growing domestic demand for foreign crops. This increase is mirrored in the monetary value of these imports, with a moving average of 1,084,758.6 USD, pointing to a steady rise in the economic value of crop imports and aligning with the increased quantities.

For food products (FP), the export data shows a moving average of 4,349,461.7 tons, indicating fluctuations in export quantities likely driven by varying market demands. Despite these fluctuations, the value of FP exports shows a rising trend, with a moving average of 1,663,083.7 USD, which may be driven by increased prices or the export of higher-value products. On the import side, the stable quantities of FP imports, with a moving average of 7,410,706.0 tons, suggest consistent demand. The upward trend in the value of these imports, reflected in a moving average of 3,736,733.8 USD, aligns with the stable quantities and potentially rising prices.

The analysis of livestock products (LP) reveals further complexities. The moving average of 88,712.2 tons for LP exports shows variability, indicating sensitivity to market conditions. Nonetheless, the increasing trend in export values, with a moving average of

140,828.4 USD, suggests that market demand and pricing drive these values upward. The moving average of 89,499.8 tons for LP imports indicates variability in import quantities, reflecting fluctuating demand. However, the steady increase in the monetary value of these imports, with a moving average of 269,370.0 USD, points to rising prices or increased demand.

In Table 3, there is provided information export and import of services in Kazakhstan for the period 2018-2022. The analysis of service exports and imports from 2018 to 2022 reveals significant insights into the stability and fluctuations within various service sectors.

TABLE 3. Export and Import of Services

Indicator	2018	2019	2020	2021	2022	Moving Average
Export (mln.USD)	7 319.9	7 745.3	5 032.0	5 886.9	7 922.7	6 781.36
Transport Services Export (mln. USD)	4 011.7	3 973.8	3 355.3	3 975.9	4 674.1	3 998.16
Passenger Services Export (mln. USD)	396.1	459.4	129.8	153.0	243.4	276.34
Cargo Services Export (mln. USD)	3 236.1	3 150.8	2 936.1	3 455.1	3 808.1	3 317.24
Other Services Export (mln. USD)	370.4	363.6	289.4	367.8	622.6	402.76
Telecommunication, Computer and Information Services Export (mln. USD)	122.5	129.9	143.4	175.8	470.3	208.38
Other Business Services Export (mln. USD)	461.9	512.3	422.2	422.0	570.0	477.68
Scientific and Technical Services Export (mln. USD)	5.5	7.0	21.3	13.3	11.8	11.78
Professional and Management Consulting Services Export (mln.USD)	118.0	144.7	124.0	135.4	175.0	139.42
Technical, Trade-related, and Other Business Services Export (mln. USD)	338.4	360.7	276.9	273.3	383.2	326.50
Import (mln.USD)	11 981.4	11 462.2	8 096.4	7 907.1	9 415.8	9 772.58
Transport Services Import (mln. USD)	2 103.2	2 502.0	2 138.9	1 967.7	2 705.3	2 283.42
Passenger Services Import (mln. USD)	165.3	192.2	35.4	56.5	87.3	107.34
Cargo Services Import (mln. USD)	1 552.5	1 867.8	1 851.1	1 679.3	2 297.2	1 849.58
Other Services Import (mln. USD)	375.0	442.0	252.4	231.8	320.7	324.38
Telecommunication, Computer and Information Services Import (mln. USD)	398.9	401.4	428.7	425.7	590.9	449.12
Other Business Services Import (mln. USD)	5 035.1	4 472.3	3 484.0	2 433.7	2 200.9	3 525.20
Scientific and Technical Services Import (mln. USD)	12.0	15.3	18.3	18.3	35.1	19.80
Professional and Management Consulting Services Import (mln. USD)	1 518.7	1 096.3	931.6	855.0	768.2	1 033.96
Technical, Trade-related, and Other Business Services Import (mln. USD)	3 504.3	3 360.7	2 534.1	1 560.5	1 397.7	2 471.46

Note: compiled by authors based on Bureau of National Statistics (2022)

The overall export value of services, with a moving average of 6,781.36 million USD, suggests a generally stable trend, albeit with slight fluctuations, indicating resilience in the service sector despite global challenges. Within this category, transport services show a consistent export value with a moving average of 3,998.16 million USD, reflecting steady demand in international logistics and transportation. Passenger services, however, displayed a sharp decline during 2020, with a moving average of 276.34 million USD, likely due to travel restrictions imposed during the COVID-19 pandemic. Still, a gradual recovery is evident after that. Cargo services maintain stable export values with a moving average of 3,317.24 million USD, indicating robustness in goods transportation.

The miscellaneous services, categorized as other services, show modest but stable growth, with a moving average of 402.76 million USD. Telecommunication, computer, and information services exports highlight growth in tech-related services, driven by increased digitalization, with an average of 208.38 million USD. Other business services, with a moving average of 477.68 million USD, demonstrate consistent export values, indicating steady demand for these services. Scientific and technical services, while low in volume with a moving average of 11.78 million USD, suggest niche but consistent activity. Professional and management consulting services maintain steady demand, reflected in a moving average of 139.42 million USD. Technical, trade-related, and other business services exhibit stable values with a moving average of 326.50 million USD, signifying consistent demand.

On the import side, the overall value of service imports, with a moving average of 9,772.58 million USD, suggests significant domestic demand for international services despite fluctuations. With a moving average of 2,283.42 million USD, transport services imports show variability but an overall high level of imports, indicating firm reliance on foreign transport services. Passenger services imports mirror global travel trends, with a significant drop in 2020 and a gradual recovery, reflected in a moving average of 107.34 million USD. Cargo services imports, maintaining stable values with a moving average of 1,849.58 million USD, indicate consistent demand for international cargo services.

Miscellaneous service imports, categorized as other services, show stable but modest growth with a moving average of 324.38 million USD. The telecommunication, computer, and information services sector shows growth in imports, driven by increasing reliance on digital services, with a moving average of 449.12 million USD. Other business services imports, with a high level of imports reflected in a moving average of 3,525.20 million USD, indicate domestic solid demand for these services. Scientific and technical services, while niche, show consistent imports with a moving average of 19.80 million USD. Professional and management consulting services imports maintain steady demand with an average of 1,033.96 million USD. Lastly, technical, trade-related, and other business services imports, with a moving average of 2,471.46 million USD, reflect consistent demand, signifying reliance on foreign expertise and services.

These observations highlight the service sector's resilience and dynamic nature in exports and imports, revealing underlying trends and economic factors that influence these trade activities. The stability in specific service categories and the fluctuations in others provide a comprehensive understanding of the service trade landscape over the analyzed period.

The actual versus fitted values for crop production, food products, and livestock production exports in USD are provided in Figure 2.

Crop Production Export: Actual vs Fitted. The regression plot for Crop Production Export shows a weak linear relationship, with the

actual values scattered around the fitted line. The regression line is nearly horizontal, indicating that changes in the quantity of crop exports (tons) do not significantly impact the USD value. The data points show considerable variability, suggesting that other factors, such as market prices, global demand, and possibly government policies, play a more substantial role in determining the export values. For instance, the data point at approximately 10 million tons corresponds to a higher USD value than expected, highlighting the influence of external factors.

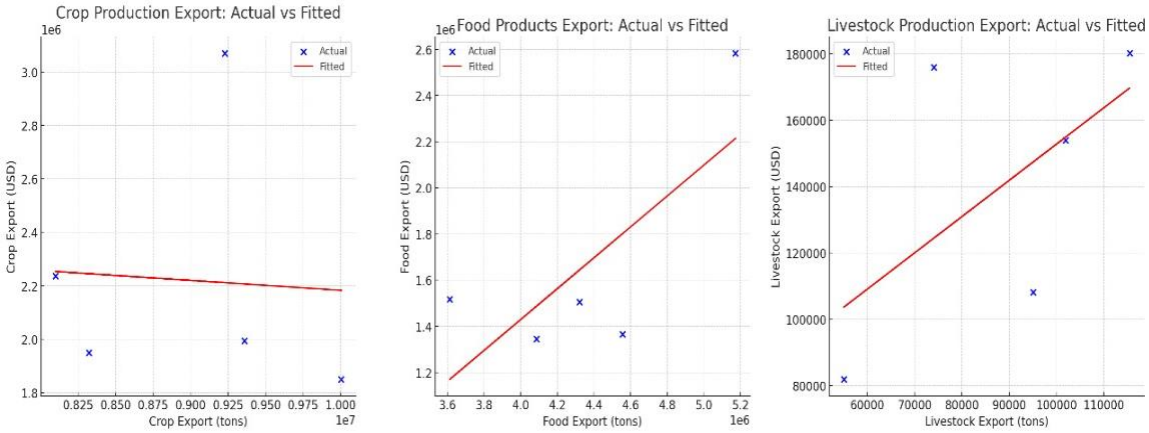

FIGURE 2. Regression Plots: Crop Production, Food Products and Livestock Production

Note: complied by authors based on calculations

Food Products Export: Actual vs Fitted. The regression plot for Food Products Export demonstrates a stronger linear relationship, with the actual values aligning more closely with the fitted line. The positive slope indicates that an increase in the quantity of food products exported (tons) is associated with an increase in the USD value. This relationship suggests that the export value of food products is more directly influenced by the quantity exported. For example, the highest data point at around 5.2 million tons corresponds to a high USD value, indicating that increased export volumes lead to higher export earnings.

Livestock Production Export: Actual vs Fitted. The regression plot for Livestock Production Export also shows a moderate linear relationship, with actual values closely following the fitted line. The positive slope indicates that an increase in the quantity of livestock exported (tons) results in a higher USD value. This suggests a strong dependency of livestock export values on the amount exported, with fewer external factors affecting this relationship. The data point at approximately 110,000 tons corresponds to the highest USD value, reinforcing the influence of export quantities on earnings.

The time series graphs in Figure 3 provide insights into trends and seasonal patterns for different categories.

Crop Production. The graph shows a declining trend in crop export quantities from approximately 10 million tons in 2018 to around 9 million tons in 2022, while the USD value of exports has steadily increased from about 1.85 million USD to over 3 million USD. This divergence suggests that the value per unit of crop exports has increased, possibly due to higher prices or improved quality. The import quantities and values show an upward trend, with imports rising from 1.4 million tons to nearly 4 million tons and the USD value increasing correspondingly, indicating growing domestic demand for foreign crops.

Food Products. The graph for food products shows fluctuating export quantities, with a peak in 2022 at around 5.2 million tons and a general upward trend in USD values from 1.36 million USD in 2018 to 2.58 million USD in 2022. This pattern suggests dynamic market conditions and changing consumer preferences. Import quantities remain relatively stable, around 7.4 to 7.6 million tons, while the USD value shows an upward trend, reflecting stable demand and possibly rising prices.

Livestock Production. The livestock production graph illustrates significant variability in export quantities and USD values, with a peak in 2019 at around 115,000 tons and corresponding fluctuations in USD values. This variability indicates sensitivity to market conditions and supply chain factors. Import quantities peak in 2020, followed by a decline, while the USD values remain relatively high, suggesting consistent demand despite quantity fluctuations.

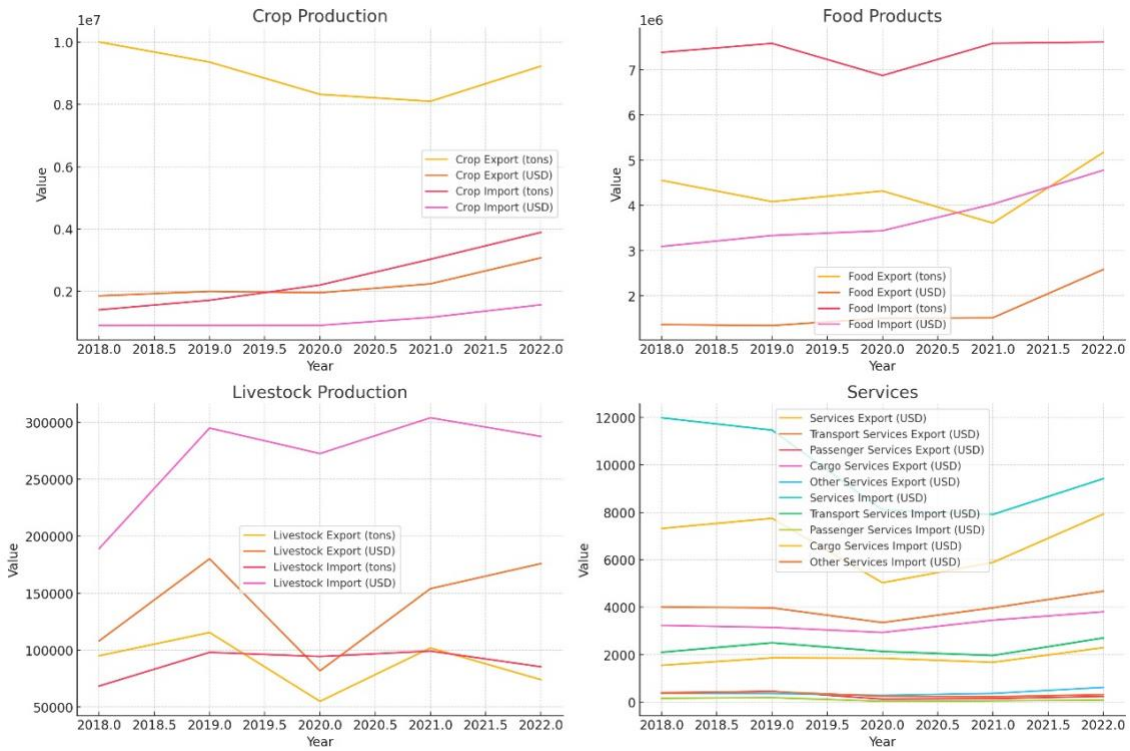

FIGURE 3. Time Series Trends: Crop Production, Food Products, Livestock Production, and Services

Note: complied by authors based on calculations

Services. The services graph shows a consistent increase in export values across different service categories, highlighting the growing importance of the service sector in the economy. For instance, the USD value of Transport Services Export remains around 4,000 to 4,600 million USD. At the same time, other services like Telecommunication and Computer Services show significant growth, with values rising from about 122 million USD in 2018 to 470 million USD in 2022. This trend underscores the increasing reliance on digital services and the global integration of the service economy. Import values also show an upward trend, particularly in Transport Services, reflecting strong domestic demand for international services.

The correlation matrix in Figure 4 provides insights into the relationships between various trade indicators. High correlations between

import and export values within the same category (e.g., Crop Import (tons) and Crop Import (USD)) indicate that the quantity of imports strongly influences the USD value. For instance, the correlation coefficient 0.95 between Crop Import (tons) and Crop Import (USD) suggests a nearly direct relationship, implying stable prices and demand. In contrast, weaker correlations between different categories (e.g., Crop Export (tons) and Food Export (USD)) suggest that other factors, such as market conditions and global demand, significantly influence trade values. The correlation of -0.06 between Crop Export (tons) and Crop Export (USD) highlights the weak relationship and the role of external factors. The strong positive correlations within the Services sector, such as 0.94 between Services Import (USD) and Transport Services Import (USD), emphasize the interconnectedness and consistent demand for these services.

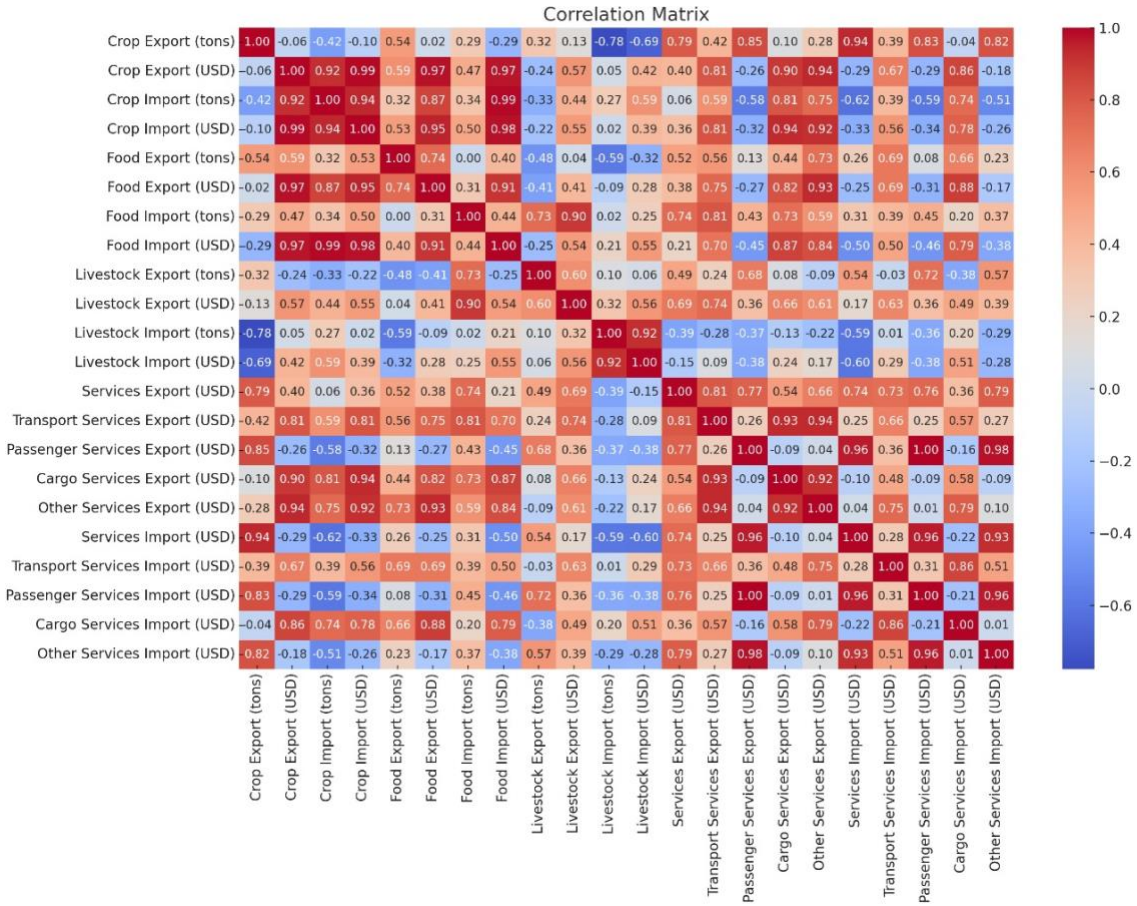

FIGURE 4. Correlation Matrix

Note: complied by authors based on calculations

The R-squared value of 0.003 indicates a fragile relationship for crop production, with only 0.3% of the variance in crop export value explained by the quantity exported. The adjusted R-squared of -0.329 and a p-value of 0.926 further confirm the model's poor fit and lack of statistical significance. The coefficient of -0.0176 suggests a negligible and insignificant decrease in USD value with an increase in tons. The intercept of 2,553,000

USD, representing the expected export value when quantity is zero, lacks practical significance.

The regression analysis of crop production, food products, and livestock production exports in Table 4 reveals critical insights into the relationships between the quantities exported and their respective USD values.

TABLE 4. Regression analysis of crop production, food products, and livestock production exports

Category	R-squared	Adjusted R-squared	P-value	Coefficient (tons)	Intercept
Crop Production	0.003	-0.329	0.926	-0.0176	2 553,000
Food Products	0.283	-0.009	0.395	0.1748	1 112,000
Livestock Production	0.363	0.150	0.283	1.0927	43 530

Note: complied by authors based on calculations

An R-squared value of 0.283 shows a moderate relationship for food products, with 28.3% of the variance in USD value explained by the quantity exported. However, the adjusted R-squared of -0.009 and a p-value of 0.395 indicate a poor fit and lack of statistical significance. The coefficient of 0.1748 suggests a slight increase in USD value per additional ton exported, though this relationship is not statistically significant. The intercept of 1,112,000 USD is not practically meaningful. In livestock production, the R-squared value of 0.363 indicates a stronger relationship, with 36.3% of the variance in USD value explained by the quantity exported. The adjusted R-squared of 0.150 suggests a reasonable fit but leaves significant unexplained variance. Despite a p-value of 0.283 indicating non-significance, the coefficient of 1.0927 suggests a meaningful increase in USD value per additional ton exported. The intercept of 43,530 USD is also not practically significant.

Overall, crop production shows a fragile and insignificant relationship between quantity and export value, suggesting other factors are more important. Food products exhibit a moderate but insignificant relationship. Livestock production shows a stronger relationship, implying that export quantities are more critical in determining USD values for this category. These results highlight the need to consider multiple factors in trade analysis to understand the economic dynamics accurately.

The regression analysis of crop production, food products, and livestock production imports in Table 5 reveals strong relationships between the quantities imported and their respective USD values.

TABLE 5. Regression analysis of crop production, food products, and livestock production imports

Category	R-squared	Adjusted R-squared	P-value	Coefficient (tons)	Intercept
Crop Production	0.888	0.850	0.016	0.348	56 377.68
Food Products	0.970	0.960	0.002	0.616	5 179.80
Livestock Production	0.954	0.938	0.003	2.592	-104 350.88

Note: complied by authors based on calculations

The R-squared value of 0.888 indicates a strong relationship for crop production imports, with 88.8% of the variance in crop import value explained by the quantity imported. The adjusted R-squared of 0.850 confirms a robust model fit, slightly adjusted for the number of

predictors. The low p-value of 0.016 suggests that the regression model is statistically significant. The coefficient of 0.348 indicates a positive relationship, where each additional ton imported increases the USD value by approximately 0.348 USD. The intercept of 56,377.68 USD represents the expected import value when the quantity is zero, though this figure may have limited practical significance.

An R-squared value of 0.970 demonstrates a strong relationship for food product imports, with 97.0% of the USD value variance explained by the imported quantity. The adjusted R-squared of 0.960 reflects a robust model fit even after accounting for the number of predictors. The very low p-value of 0.002 indicates that the regression model is highly statistically significant. The coefficient of 0.616 suggests a positive relationship, with each additional ton imported increasing the USD value by approximately 0.616 USD. The intercept of 5,179.80 USD is practically meaningful as a baseline value for food product imports when the quantity is zero.

The R-squared value of 0.954 shows a solid relationship for livestock production imports, with 95.4% of the variance in USD value explained by the quantity imported. The adjusted R-squared of 0.938 indicates a strong model fit after adjusting for the number of predictors. The low p-value of 0.003 signifies that the regression model is statistically significant. The coefficient of 2.592 implies a strong positive relationship, with each additional ton imported increasing the USD value by approximately 2.592 USD. The intercept of -104,350.88 USD might indicate baseline cost adjustments or initial fixed costs when the quantity imported is zero.

In conclusion, the regression analysis for imports demonstrates strong and statistically significant relationships across all categories. Crop production and food products imports show high R-squared values, indicating that the quantity imported significantly influences the USD value. Livestock production imports exhibit the highest coefficient, suggesting a substantial impact of quantity on the USD value. These insights underscore the critical role of import quantities in determining trade values and highlight the importance of understanding these dynamics for economic policy and trade strategy development.

Trade is vital to Kazakhstan's economy, significantly contributing to GDP, employment, and economic stability. Accurate forecasts are essential for strategic planning and policy formulation, helping to optimize resources and enhance trade infrastructure (Figure 5).

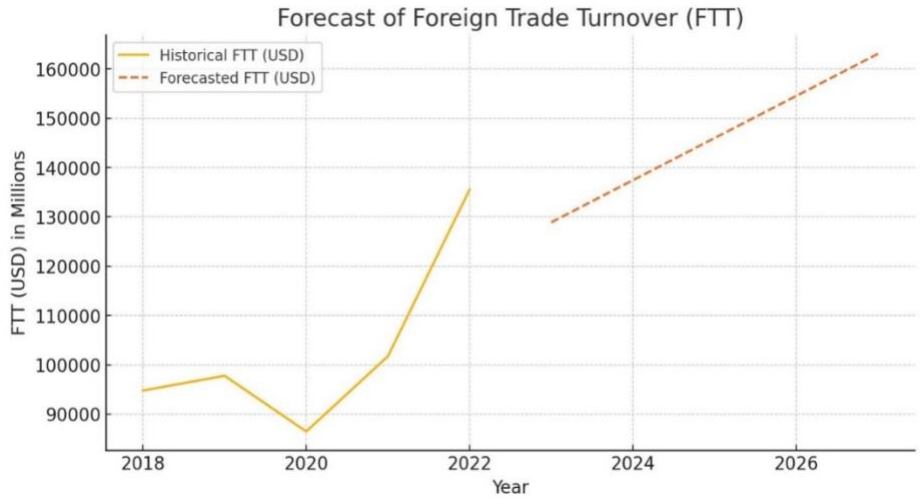

FIGURE 5. Forecast of foreign trade turnover

Note: complied by authors based on calculations

The linear regression model forecasts a steady increase in Kazakhstan's Foreign Trade Turnover over the next five years. This positive trend suggests a continued expansion of trade activities, which holds significant implications for the national economy.

The forecasted increase in FTT indicates that Kazakhstan's trade activities are expected to grow steadily. This growth is likely driven by rising export volumes and increasing import demands. Such an expansion can enhance Kazakhstan's position in global trade, particularly in the sectors with a competitive advantage, such as oil, metals, and agricultural products.

The projected growth in FTT is a positive signal for the national economy. Increased trade turnover can lead to higher export revenues, improving the trade balance and strengthening the national currency. Moreover, higher import values reflect a growing domestic market demand, which can stimulate local industries and consumer markets.

The forecasted data provide valuable insights for policymakers and economic planners. The anticipated growth in trade turnover suggests the need for strategic investments in trade infrastructure, such as ports, logistics, and transportation networks, to handle the increased volume efficiently. Additionally, there is a need to diversify the export base to reduce dependence on a few key sectors and to mitigate risks associated with global market fluctuations.

A growing FTT can contribute to a more favorable trade balance, provided that export growth outpaces import increases. This can enhance economic stability by reducing trade deficits and fostering a more resilient economy. Strategic efforts to promote value-added exports can further amplify these benefits, creating more jobs and boosting income levels within the country.

The optimistic forecast also indicates potential opportunities for both domestic and foreign investments. The growing trade volumes and the prospects of a thriving economy may attract investors. This can lead to new industries, technological advancements, and overall economic diversification, which are crucial for sustainable growth.

The forecasted increase in Kazakhstan's Foreign Trade Turnover from 2023 to 2027 underscores the importance of trade as a driver of economic growth. The steady upward trend suggests a robust and expanding trade sector, which can significantly contribute to the national economy. Policymakers and economic planners should leverage these insights to develop strategies that enhance trade infrastructure, diversify the export base, and attract investments. By doing so, Kazakhstan can maximize the benefits of increased trade turnover, leading to sustained economic development and improved living standards for its population.

5. CONCLUSIONS

The research aimed to evaluate the relationship between the quantities of exported and imported agricultural and livestock products and their respective USD values, with specific research hypotheses formulated to guide the analysis. The study achieved these aims and hypotheses, revealing significant insights into Kazakhstan's trade dynamics.

The findings indicate that while export volumes of agricultural products do not significantly influence their trade values, import volumes strongly correlate with USD values, especially in the food and livestock sectors. The forecasted growth in Foreign Trade Turnover (FTT) from 2023 to 2027 shows a steady increase, suggesting continued expansion in trade activities.

To accommodate the forecasted increase in trade activities, Kazakhstan should invest in upgrading its trade infrastructure, including ports, logistics, and transportation networks. Improved infrastructure will facilitate the efficient handling of higher trade volumes and support the seamless movement of goods.

Given the weak correlation between export volumes and trade values for agricultural products, there is a need to diversify the export base. Developing value-added products and

exploring new markets can reduce reliance on a few key sectors and enhance overall trade value.

The optimistic forecast for FTT suggests potential investment opportunities. Kazakhstan should create an attractive investment climate by offering incentives, reducing regulatory barriers, and ensuring political and economic stability to attract domestic and foreign investors.

Kazakhstan should promote environmentally sustainable trade practices to align with sustainable development goals. This includes encouraging the export of eco-friendly products, implementing green logistics solutions, and ensuring compliance with international environmental standards.

Investing in education and training programs to build a skilled workforce capable of supporting the expanding trade sector is essential. Enhanced human capital will improve productivity, innovation, and competitiveness in the global market.

AUTHOR CONTRIBUTION

Writing – original draft: Berik Kadyrov, Bibolat Kuantkan.
Conceptualization: Berik Kadyrov, Bibolat Kuantkan.
Formal analysis and investigation: Berik Kadyrov, Bibolat Kuantkan.
Funding acquisition and research administration: Berik Kadyrov.
Development of research methodology: Berik Kadyrov, Bibolat Kuantkan.
Resources: Berik Kadyrov, Bibolat Kuantkan.
Software and supervisions: Berik Kadyrov.
Data collection, analysis and interpretation: Kadyrov Berik.
Visualization: Berik Kadyrov, Bibolat Kuantkan.
Writing review and editing research: Berik Kadyrov, Bibolat Kuantkan.

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Unveiling the Financial Performance Impact: Internal Auditing's Role in Saudi Firms

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ABSTRACT

This study aims to investigate the direct impact of internal auditing (IA) on financial performance (FP) and its indirect effect mediated through an internal control system (ICS). The examination utilizes responses from 257 professionals in roles such as accountant, financial manager, financial controller, financial auditor, or head of an internal audit unit within a selected sample of firms in the Kingdom of Saudi Arabia (KSA). Utilizing PLS modeling for analysis, the study reveals a significant direct influence of IA on FP. Additionally, the study demonstrates that IA, through its impact on ICS, contributes to the enhancement of FP. The mediation of ICS between IA and FP in Saudi firms was tested and found to be partial. Notably, the indirect influence of IA on FP was observed to be more pronounced than its direct influence. Researchers have argued that independent IA plays a vital role in supporting firms' ability to maintain and improve performance, and in this study the role of IA is tested in relation to mediating FP through improved ICS. The findings suggest that firms should emphasize the importance of IA in their strategic planning and resource allocation to enhance their overall financial health. Furthermore, the results highlight the necessity for continuous training and development for IA professionals to ensure they are equipped with the latest skills and knowledge to effectively improve ICS and, consequently, FP. Based on our findings and in support of the proposed model, we concluded that IA improved ICS, which, in turn improved FP. Hence, it is necessary for firms to solicit adequate independent IA to improve ICS, with the further goal of improving FP.

KEYWORDS: Internal Auditing, Financial performance, Internal control system, PLS modeling, Saudi Arabia

SCSTI: 06.73.03

JEL Code: G32, M42, M48

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1. INTRODUCTION

In the wake of the financial scandals in the early 2000s involving publicly traded companies such as Enron Corporation, Tyco International plc, and WorldCom, internal audit (IA) has come under increasing scrutiny and experienced a remarkable change in scope and functions (Vinten, 2003). In response to these financial scandals, the U.S. Congress passed the Sarbanes-Oxley Act (SOX) in 2002, the broad aim of which was to improve accountability, add value, and help organizations achieve their objectives. The act has required both managers and internal auditors of public companies to take on more responsibilities to apply new fraud prevention measures to detect and deter fraud (Patterson and Smith, 2007). The act has also required public companies to have effective internal control systems (ICS) which encompass the means and actions necessary to facilitate operational risk management. The rationale for this requirement is that having an effective ICS makes fraud more difficult to commit and easier to detect (Patterson and Smith, 2007). This requirement also enables companies to (1) protect their resources against waste and inefficiency; (2) ensure accuracy and reliability in accounting and operating data; (3) ensure compliance with the policies of the organization; and (4) evaluate the level of performance for each unit (SOX, 2002).

In the same vein, the Institute of Internal Auditing (IIA) has noted that IA's activities should include supporting leadership, creating more values, participating in strategic development and risk management, and ensuring that the system of internal control is operating effectively. The IIA assumes that having effective IA functions may contribute to enhanced risk management (Harrington, 2004), providing management with assurance and an in-house consulting service which reduces risks and improves companies' profitability and market value (Dsouza and Jain, 2021; Bshayreh et al., 2021). Hermanson and Rittenberg (2003) and Alzeban & Gwilliam (2014) believe that the existence of effective IA functions reduces an organization's malpractices and irregularities, with organization failure being the result of the poor implementation of IA. Hence, the roles of IA have expanded on both practical and strategic levels. On the practical level, IA functions have become a cornerstone for (1) establishing a sound corporate governance process (Soh & Bennie, 2011); (2) enhancing the reliability and integrity of companies' financial and operational information, which helps all levels of management make appropriate business decisions; and (3) enabling companies to have efficient growth and development to maintain sustainable financial conditions (Muchiri and Jagongo, 2017).

On the strategic level, IA roles have expanded from value preservation to value creation by focusing more on key preservation control activities to improve IA capabilities. For example, to monitor the ICS, the current IA focus is on whether it is the right system and whether it is being performed correctly and in a cost-effective manner (e.g., moving from manual/detective control to automated/preventive controls). Meanwhile, historically, the focus was on whether the system was being performed or procedures were being followed (KPMG, 2007).

The logical assumption in the above introduction is one which supports the theory that there exists an interactive relation between IA functions and the ICS, and that this relation impacts companies' financial performance (FP). Nonetheless, this potential relationship and its impact on FP has not been fully examined and empirical evidence concerning its impact on companies' FP is needed. Therefore, the broad aim of this study is to address this gap in the literature and examine the impact of IA through ICS on financial performance in Saudi Listed Companies.

This study is motivated by the slowdown of global economic growth due to COVID – 19 over the past few years. All types of business have experienced significant challenges, and the FP of most companies, including Saudi Listed Companies, has been affected due to the pandemic (Makni, 2023). Alhawel et al. (2020)

argued that having an appropriate internal corporate governance might mitigate the decline in FP, and internal auditors may be part of this solution by ensuring that these companies have effective ICS (Odek and Okoth, 2019). The study is also motivated by the unique Saudi business environment and a growing capital market, particularly driven by the country's adoption of the Vision 2030. Alsaeed (2006) states that these growing capital markets have several open windows for research and more studies on these markets are needed to attract the attention of regulatory bodies and firm managers. This study also contributes to the literature on the roles played by internal auditors in strengthening the internal control system to improve companies' financial performance.

Several studies have examined the impact of IA functions and the ICS on companies' FP (Hitt et al., 1996; Ejoh and Ejom, 2014; Sarens & Abdolmohammadi, 2010; Brennan & Soloman, 2008). These studies have used different financial measures, including the return on equity, revenue growth, return on stock, return on asset, and return on sales, among others. In this study, we examine the existence of this link based on the perceptions of those with first line knowledge, including accountants, financial managers, financial controllers, financial auditors, and heads of IA audit units at a selected sample of listed companies in the Kingdom of Saudi Arabia (KSA).

The present study is organized as follows: the next section, Section 2 provides the theoretical background. Section 3 presents the literature review and hypotheses development, while Section 4 delineates the methodological approach and data collection procedures. Section 5 details descriptive findings, followed by Section 6 which presents the empirical results and the discussion of these results. The paper concludes with a final section.

2. LITERATURE REVIEW

Several studies in the accounting and auditing literature have employed the agency theory as a theoretical framework. This theory argues that in publicly held companies, agency costs are likely to be increased by the separation between owners and management (Jensen & Meckling, 1976). According to this theory, while owners (principals) hire managers (agents) to represent their interests and manage their companies in accordance with their strategies, managers may sometimes try to serve their own personal interests. For example, owners may have strategic objectives which aim to maximize the market value of their companies and increase their wealth. On the other hand, managers may be concerned with maximizing profits and increasing short-term market value to increase their salaries and bonuses (Huong et al., 2022).

This study leverages agency theory to explore the impact of Internal Auditing (IA) on Financial Performance (FP) through Internal Control Systems (ICS). The investigation is based on responses gathered from a Likert-type survey completed by professionals in roles such as accountants, financial managers, financial controllers, financial auditors, and heads of internal audit units at various firms in Saudi Arabia (KSA). In the context of KSA firms, the agency theory is applied, where management assumes the role of the principal and staff as the agents. The theory suggests that organizations striving for optimal financial performance should mitigate the negative effects of the agent-principal relationship by implementing robust internal control systems and incorporating effective internal auditing practices.

The presence of external and internal auditors may help mitigate this agency problem, though Fonseca et al. (2020) argue that internal auditors may play a more effective role than external auditors in companies' achievement of their strategic objectives. The main role of internal auditors is to verify a company's corporate governance, ICS, and risk management with the aim of increasing its value and enhancing its FP for the long term. Meanwhile, the main task of external auditors is to verify and assess the truth and fairness of a company's annual financial reports. The

association between IA functions and FP has been explored by several studies, with some identifying the two factors as being linked directly and others identifying them as being linked through a company's ICS. Financial performance is an indicator of a company's ability to survive in the unforeseeable future, and it is also an indicator of how a company's resources are controlled and managed to safeguard assets, increase efficacy, and achieve objectives (Subhi and Stanišić, 2016). Dahir & Omar (2016) collected data from 200 questionnaires to explore the impact of IA practices on organizational FP in selected Somalian companies, identifying a significant positive relationship between the two factors. Albkour & Chaudhary (2017) also explored the impact of IA on organizational FP in selected banks in Jordan among a sample of 145 employees, with the findings also indicating a significant impact of IA.

In addition, Jordan, Alflahat (2017) explored the impact of IA on the organizational FP of Jordanian companies including Jordan Telecom, National Petroleum Company, and Jordan Electric Power Company. Data were collected using a questionnaire completed by a sample of 290 employees, and multiple linear regression was used to analyze the data, with IA as the independent variable and organizational FP as the dependent variable. The proxy measures of internal audit were internal controls, professional competence, independence of internal audit, and internal audit standards, and the findings indicated a significant impact of IA on organizational FP. Similarly, Dsouza and Jain (2021) explored the role that IA plays in helping organizations maintain financial stability and attain their financial goals, reporting a positive correlation between IA quality and FP. Dsouza and Jain highlighted that it is important that internal auditors comply with auditing standards and best practices when assessing the financial records of an organization, as this ensures financial stability and improves the confidence of stakeholders in management practices.

Kenya, Simbiri et al. (2023) examined the roles of IA practices in monitoring and controlling risks to improve transparency and honesty in the financial reporting process. The Positive Accounting Theory of Internal Auditing Risk Planning, the Contingency Theory of Risk Management, and the Agency Theory of Internal Audit Capacity formed the theoretical framework of the study. The regression analysis showed that risk-based audit has the potential to enhance transparency and accountability, which is likely to impact FP significantly. The researchers concluded that taking risk into account makes internal auditors more likely to help organizations prioritize their resources and hence increase their profits.

The logic conclusion of the literature reviewed is the existence of direct relationship between IA practices and companies' FP. It seems likely that the IA practices could have a pivotal role in the process of managing risks that could be experienced by companies, verifying their financial reports, safeguarding their assets, and improving the efficiency of the uses of these assets (Hermanson and Rittenberg, 2003; Gwilliam, 2014; Alflahat, 2017; Subhi and Stanišić, 2016; Badara, 2013). In addition, the agency theory argues that agency costs arise from the separation between owners and management in publicly held companies. Fonseca et al. (2020) argued that internal auditors are likely to decrease these costs since they are concerned with improving FP and owners' wealth in the long term. Based on this relationship that has been observed between the IA practices and companies' FP, the following hypothesis was developed:

H1: Internal auditing (IA) has a significant direct influence on financial performance (FP)

The Institute of Internal Auditing (IIA) has identified the roles played by internal auditors as supporting leadership, increasing more values, developing strategic plans, ensuring risk management, and ensuring that the ICS is operating effectively (Hermanson and Rittenberg, 2003, and Gwilliam, 2014). Badara (2013) explored the impact of IA on ICS effectiveness at the local government level, concluding that IA functions can have a positive impact on ICS effectiveness and can

help organizations attain their goals. Likewise in Malaysia, the explanatory study of Haron et al. (2014) examined the role played by IA in supporting management with improving the performance of their public sector organizations.

The findings indicated that IA is designed to increase an organization's value, as it provides independent assurance that the governance, internal control, and risk management processes of an organization are operating effectively and efficiently. It was also found that IA can influence professional practices and help in the establishment of an effective accountability system. In the Provincial Treasuries of South Africa, Msindwana & Ngwakwe (2022) studied the association between internal audit effectiveness and financial accountability, with the broad aim of identifying IA's role in enhancing control on public sector expenditures and transparency. Adopting a quantitative approach, data were collected from nine provincial treasuries of South Africa, and the findings indicated that across all the expenditure programs of provincial treasuries in South Africa, IA has the potential to enhance financial accountability. It was concluded that IA should be adopted by government departments as a monitoring tool for improving financial accountability and delivering public services.

Given that internal auditors play an essential role in reviewing and strengthening companies' ICSs, (Harrington, 2004; Dsouza and Jain, 2021; Bshayreh et al., 2021; Hermanson and Rittenberg, 2003 and Alzeban & Gwilliam, 2014), it could be deducted that there is an interactive relation between IA functions and the ICS, and accordingly the following hypothesis was developed:

H2: Internal auditing (IA) has a significant influence on internal control system (ICS).

The ICS is necessary for ensuring efficient and effective operations and hence safeguarding assets. It is also important for maintaining effective management control, a clear definition of objectivity, and adequate support from top management. Khamis (2014) explored the effectiveness of the ICS in a selection of banks in Zanzibar, with the aim of establishing a relationship between ICS and FP. A cross-sectional survey was used for data collection, and the results indicated a significant positive relationship between ICS and organizational FP. Khamis concluded that to some extent, banks in Zanzibar have sound ICSs, though all aspects of ICS could be enhanced by management at these banks. In another study, Kinyua et al. (2015) examined the impact of ICS on FP at Nairobi Security Exchange (NSE) listed companies. Several ICS components were examined, including internal audit, control environment, internal control activities, risk management, and role of corporate governance controls. Primary and secondary data were analyzed using SPSS, and the hypotheses were tested using correlation analyses, ANNOVA, and Chi-Square. The findings indicated a significant impact of ICS on FP, with the researchers concluding that companies ought to enhance their ICSs in order to improve FP.

The relationship between ICS and FP was also explored by Ejoh and Ejom (2014) at Cross River State College of Education, an academic institution in Nigeria. Although the findings did not indicate a significant and direct association between ICS and FP, the results did highlight that having an effective ICS is essential for reducing theft. They found that fraudulent activities in public sector organizations can be effectively detected and prevented by IA, especially if auditors are equipped with electronic data processing and an environment within which they have the freedom to carry out their work efficiently.

Otoo et al. (2021) explored the failures and crises experienced by the banking industry worldwide. The study aimed to find out the extent to which financial institutions worldwide depend on ICS effectiveness and efficiency for their growth and development. Specifically, the researchers were interested in assessing the impact of the five elements of ICS (i.e., risk assessment, control environment, information and communications, monitoring, and control activities) on the performance of universal banks in Ghana. The study followed

a quantitative research approach using a regression analysis tool, and the findings indicated that all the ICS elements had a positive impact. This supported the findings of Pickett (2010) and Steinberg (2011), who reported that the ICS elements interact to form an integrated system which is essential for enterprises' successful operation.

Based on the literature reviewed it is obvious that internal auditors are required to verify the ICS to identify its strengths and weaknesses and provide management with suggestions on how to rectify these weaknesses Harrington, 2004; Dsouza and Jain, 2021; Bshayreh et al., 2021; Hermanson and Rittenberg, 2003 and Alzeban & Gwilliam, 2014). It is also obvious that having an effective ICS in a company is essential for protecting its resources against waste and inefficiency, ensuring the accuracy and reliability of its financial reports, and its FP (Patterson and Smith, 2007; Khamis, 2013 & 2014; Ejoh and Ejom, 2014; Kinyua et al., 2015). In addition, the agency theory suggests that there is always an agency problem due to the inefficiency of companies' ICSs. This agency problem results from the separation between ownership and management in publicly listed companies. Hence, the agency theory argues that the existence of an effective ICS is likely to improve a company's growth, transparency, leadership, social responsibility and trust, protection of shareholders and company assets, and FP (Henze, 2010). Hence, the following two hypothesis were developed:

H3: Internal control system (ICS) has a significant influence on financial performance (FP).

H4: Internal control system (ICS) mediates the association between internal auditing (IA) and financial performance (FP).

3. METHODOLOGY

Instrument Design

We developed a questionnaire using scales adopted from earlier studies to collect data from the respondents. The questionnaire consisted of two sections, with the first section focusing on personal demographics (i.e., gender, age, education, major, place of employment, practical experience, title, and professional qualifications) and firm characteristics (i.e., company sector by ownership, company age, and company size measured by number of employees). The second section comprised statements used to measure the variables of interest anchored to a 5-point Likert-type scale ranging from strongly agree (5) to strongly disagree (1). The scales for the variables were as follows:

– Internal audit scale: 10 statements taken from Kiabel (2012) and adapted for the purpose of the present study.

– Internal control system scale: 12 statements taken from Ejoh and Ejom (2014) and adapted for the purpose of the present study;

– Profit scale: 6 statements taken from Adeinat and Kassim (2019) and Al Rahahleh et al. (2023) and adapted for the purpose of the present study;

– ROI scale: 2 statements taken from Adeinat and Kassim (2019) and Al Rahahleh et al. (2023) and adapted for the purpose of the present study;

– ROE: 2 statements taken from Adeinat and Kassim (2019) and Al Rahahleh et al. (2023) and adapted for the purpose of the present study;

– External influences: 2 statements taken from Kiabel (2012) and adapted for the purpose of the present study.

The scales, which were originally published in English, were translated into Arabic by a language editor. Face validity was examined and confirmed by experts with significant experience in the design of questionnaire instruments.

Analysis Approach

The model proposed in this study is designed to test the possible role of internal control system (ICS) as a mediator between internal auditing (IA) and financial performance (FP). Quantitative data were collected using the developed questionnaire and then analyzed. Given that it is more effective than comparable models such as

univariate analysis using SPSS in terms of analyzing measurement models and structural models simultaneously, Partial Least Squares (PLS) modelling was used to evaluate the measurement model and the hypotheses. The measurement model was examined based on reliability (Cronbach's alpha), convergent validity (individual item standardized factor loading), composite reliability (CR), average variance extracted (AVE), and discriminant validity (Fornell-Larcker, heterotrait-monotrait ratio of correlations (HTMT)). The structural model was examined based on the coefficients of predictive capability (adjusted R2) and beta coefficients (with significance levels reported) through bootstrapping (5,000 subsamples), (Hair et al., 2021; Ringle et al., 2015).

Sampling and Data Preparation

In the present study, we examine the influence of ICS as a mediator between IA and FP based on a sample of firms operating in the KSA. Data were collected using a self-administered structured questionnaire instrument completed by a sample of professionals engaged in work related to internal audit tasks at targeted firms. Responses were collected during the period of April to June 2022. In total, 316 completed responses were received, of which 58 questionnaires were found to have consistent patterns and were therefore considered invalid and excluded from the analysis. Further, another response was dropped from the analysis because it was identified as an outlier based on Cook's distance value, according to which the cutoff value is > 0.1. The final sample therefore comprised 257 valid responses. The skewness and kurtosis values were found to be around zero and were therefore within the range of ±2.2, as proposed by Sposito et al. (1983). Finally, Harman's single-factor test was performed to determine the influence of the common method bias. The single-factor solution was not a good fit for the data given that the variance was found to be 38.94% and, therefore, < 50%, indicating that bias is not an issue in the dataset (Podsakoff et al., 2012).

Respondents' Characteristics and Firms' Characteristics

Table 1 presents respondents' characteristics including gender, age, level of education, field of their professional experience and interests.

TABLE 1. Respondents' characteristics (n = 257)

Group/Sub-Group	N	%
Gender		
Male	219	85.2%
Female	38	14.8%
Age		
24 years or below	10	3.9%
25–34 years	116	45.1%
35–44 years	96	37.4%
45–54 years	28	10.9%
55 years and older	7	2.7%
Highest educational level achieved		
High school diploma or below	49	19.1%
Bachelor	147	57.2%
Postgraduate	61	23.7%
Other	--	--
Major		
Accounting	94	36.6%
Finance	28	10.9%

PA	30	11.7%
BA	44	17.1%
Other	61	23.7%
Sector		
Public sector	91	35.4%
Private sector	155	60.3%
Freelance	5	1.9%
Other	6	2.3%
Professional experience		
Fewer than 5 years	65	25.3%
5–9 years	78	30.4%
10–14 years	53	20.6%
15 years or more	61	23.7%
Title		
Accountant	128	49.8%
Financial manager	36	14.0%
Financial controller	22	8.6%
Financial auditor	54	21.0%
Head of internal audit unit	17	6.6%
Professional certification		
SCOPA	24	9.3%
CPA	18	7.0%
ACCA	3	1.2%
CMA	17	6.6%
IPSAS	6	2.3%
None (did not hold a professional certification of any kind)	189	73.5%

Note: complied by authors

Many of the respondents were male (n = 219, 85.2%), while only 14.8% of the total sample were female (n = 38) (Table 1). The composition of the sample reflects the dominance of men in professions associated with internal audit tasks and processes in KSA firms. In terms of age, the majority of the respondents were in their late twenties or thirties, which we anticipated given that internal audit roles are not usually associated with entry-level positions. The age categories reflected in the sample were as follows: 24 years or below (n = 10, 3.9%), 25–34 years (n = 116, 45.1%), 35–44 years (n = 96, 37.4%), 45–54 years (n = 28, 10.9%), and 55 years or older (n = 7, 2.7%). Overall, the sample showed a high level of formal education, as only a small proportion of the respondents reported a high school diploma or less as the highest level of education achieved (n = 49, 19.1%). Meanwhile, over half of the respondents reported that a bachelor's degree was their highest qualification (n = 147, 57.2%), and close to a quarter reported having completed a postgraduate degree (n = 61, 23.7%).

The respondents had majored in the following subjects: accounting (n = 94, 36.6%), public accounting (PA) (n = 30, 11.7%), business administration (n = 44, 17.1%), finance (n = 28, 10.9%), and other (n = 61, 23.7%). The participants held professional certifications from various professional bodies as follows: Saudi Organization for Chartered and Professional Accountants (SCOPA) (n = 24, 9.3%), Chartered Public Accountant (CPA) (n = 18, 7.0%), Certified Management

Accountant (CMA) (n = 17, 6.6%), International Public Sector Accounting Standards (IPSAS) (n = 6, 2.3%), and Association of Chartered Certified Accountants (ACCA) (n = 3, 1.2%), whilst the remaining respondents (almost three quarters) did not hold a further professional certification of any kind (n = 189, 73.5%).

In terms of professional experience, just over a quarter of the sample had fewer than 5 years of experience (n = 65, 25.3%), whilst almost a third of the sample had 5 - 9 years of experience (n = 78, 30.4%). Slightly more than a fifth had 10 – 14 years (n = 53, 20.6%), and just under a quarter of the sample had 15 years or more of experience (n = 1, 23.7%).

The sample showed significant diversity in terms of sectors and titles. Almost two thirds of the respondents were employed in the private sector (n = 155, 60.3%), while just over a third were employed in the public sector (n = 91, 35.4%).

Meanwhile, a very small proportion fell in the 'other' category (n = 6, 2.3%), and an even smaller proportion reported being engaged in freelance work (n = 5, 1.9%). With regards to the respondents' titles, just under half were designated as accountants (n = 128, 49.8%), a fifth as financial auditors (n = 54, 21.0%), 14% as financial managers (n = 36), 8.6% as financial controllers (n = 22), and 6.6% as heads of internal audit units (n = 17).

Table 2 presents the firms' characteristics, including company experience based on the type, age and size (employment).

TABLE 2. Firms' characteristics (n = 257)

Group/Sub-Group	N	In Percentage
Company type		
Public shareholding company	70	27.2
Private company	121	47.1
Public sector	62	24.1
Other	4	1.6
Company size (number of employees)		
≤100	58	22.6
101–200	38	14.8
201–400	26	10.1
401–600	13	5.1
601–900	7	2.7
>900	115	44.7
Company age		
After 2000	67	26.1
1981–2000	46	17.9
1951–1980	76	29.6
1920–1950	68	26.5

Note: compiled by authors

Approximately half the surveyed respondents held a position at a private company (n = 121, 47.1%), more than a quarter (n = 70, 27.2%) held a position at a public shareholding company, almost a quarter (n = 62, 24.1%) held a position in the public sector, and very few respondents were employed (n = 4, 1.6%) at other types of companies. Further, the companies represented differed considerably in size as measured by number of employees. Close to half of the respondents (n = 115, 44.7%) held positions at large firms with more than 900 employees, and at the other end of the scale, just over a fifth (n = 58, 22.6%) held positions at small firms with 100 or fewer employees. Meanwhile, 14.8% of the respondents were at firms with 101–200 employees (n = 38), 10.1% at firms with 201–400 employees (n = 26), 5.1% at firms with

401–600 employees (n = 13), and 2.7% at firms with 601–900 employees (n = 7).

Finally, the firms represented were relatively diverse in terms of age. Firms established between 1950 and 1980 accounted for the largest proportion, i.e., almost a third of the sample (n = 76, 29.6%), whereas those established after 2000 accounted for more than a quarter of the sample (n = 67, 26.1%). Firms established between 1920 and 1950 (n = 68, 26.5%) also comprised more than a quarter of the sample, while firms established between 1980 and 2000 formed slightly less than a fifth of the sample (n = 46, 17.9%).

4. FINDINGS AND DISCUSSION

According to the descriptive findings presented in Table 3, the respondents showed a high level of agreement on all the variables of interest, according to which their firms have a high level of IA (M = 4.09), ICS (M = 4.11), Profit (M = 3.80), ROI (M = 3.86), ROE (M = 3.88), and FP (M = 3.85).

TABLE 3. Foreign Trade Turnover Analysis Mean and std. values (n = 257)

Variable	Descriptive analysis					Pearson correlations					
	Mean	**Level+**	**Std.**	**Min**	**Max**	**1**	**2**	**3**	**4**	**5**	**6**
IA	4.09	High	0.63	2.30	5.00	1					
ICS	4.11	High	0.61	2.08	5.00	0.726**	1				
Profit	3.80	High	0.86	1.00	5.00	0.352**	0.445**	1			
ROI	3.86	High	0.87	1.00	5.00	0.400**	0.440*	0.724**	1		
	3.88	High	0.86	1.00	5.00	0.369**	0.476**	0.727**	0.722**	1	
Financ. perform.	3.85	High	0.78	1.00	5.00	0.414**	0.502**	0.904**	0.903**	0.903**	1

Note: compiled by authors

** Correlation is significant at the 0.01 level.

+ The mean values were classified using the three-level scale suggested by Sekaran and Bougie (2019), which has been utilized in previous studies (e.g., Al Rahahleh, 2022) as: 3.67–5.00 indicating a high level of agreement, 2.34–3.669 denoting a moderate level of agreement, and 1–2.339 representing a low level of agreement.

The std. values were <1, which indicates agreement among the respondents. Further, the Pearson correlation indicated that FP is significantly and positively correlated with both IA and ICS, thereby providing support for the proposed framework. The Pearson correlation for IA and FP was r = 0.414**, and the Pearson correlation for ICS and FP Financial performance was r = 0.502**.

Step 1: Testing the measurement model

The measurement model was tested to determine the validity and reliability of the model factors. Next, in Table 4 there are provided results for model factors testing for export and import of agricultural products. We assessed the model factors by checking reliability (Cronbach's alpha), convergent validity (individual item standardized factor loading, composite reliability (CR), average variance extracted (AVE), and discriminant validity (Fornell-Larcker, Heterotrait-Monotrait Ratio of Correlations (HTMT)).

Regarding individual item standardized factor loading, a value of 0.50 is the generally accepted rule of thumb, although a value of 0.70 is preferred. All the statements were found to have a factor loading above 0.50, with a value greater than 0.70 for most of them. All the t-values were above 1.96 at a probability level of 0.05. All the factor loadings were significant and, therefore, confirmed the convergent validity of the model. Further, the AVE coefficients were above the generally accepted value of 0.50 for all the factors, which further confirmed the convergent validity of the model.

TABLE 4. Export and Import of Agricultural Products

Variable (**P <0.001)	Q	FL	t-value	Cronbach's α	CR	AVE
IA	IA1	0.691	17.902**	0.898	0.916	0.523
	IA2	0.751	22.510**			
	IA3	0.784	28.272**			
	IA4	0.698	18.993**			
	IA5	0.751	20.384**			
	IA6	0.761	24.993**			
	IA7	0.725	20.592**			
	IA8	0.704	19.070**			
	IA9	0.719	24.670**			
	IA10	0.636	14.170**			
ICS	ICS1	0.678	18.089**	0.912	0.926	0.511
	ICS2	0.748	19.733**			
	ICS3	0.717	24.300**			
	ICS4	0.755	15.685**			
	ICS5	0.677	11.718**			
	ICS6	0.604	23.843**			
	ICS7	0.737	21.851**			
	ICS8	0.756	18.773**			
	ICS9	0.689	25.366**			
	ICS10	0.739	24.699**			
	ICS11	0.755	17.178**			
	ICS12	0.705	23.479**			
Profit	P1	0.703	16.00**	0.927	0.944	0.738
	P2	0.902	47.861**			
	P3	0.853	26.332**			
	P4	0.855	43.609**			
	P5	0.905	65.290**			
	P6	0.890	48.541**			
ROI	ROI1	0.937	75.350**	0.841	0.926	0.863
	ROI2	0.944	100.166**			
ROE	ROE1	0.926	59.847**	0.869	0.938	0.884
	ROE2	0.931	76.873**			

Note: compiled by authors

The CR and Cronbach's alpha coefficients contributed to both the convergent validity and internal consistency of the factors, all of which were above the generally accepted value of 0.70.

The coefficients of Cronbach's alpha, CR, and AVE were as follows: IA (Cronbach's alpha = 0.898, CR = 0.916, AVE = 0.523); ICS (Cronbach's alpha = 0.912, CR = 0.926, AVE = 0.511); Profit (Cronbach's alpha = 0.927, CR = 0.944, AVE = 0.738); ROI (Cronbach's alpha

= 0.841, CR = 0.926, AVE = 0.863); and ROE (Cronbach's alpha = 0.869, CR = 0.938, AVE = 0.884).All the model factors met the standard for discriminant validity in relation to Fornell and Larcker's (1981) criterion, which is based on comparing the square root of the AVE value with the correlation between each pair of constructs.

Table 5 presents the discriminant validity results, showing that the square root of each of the AVE coefficients was greater than the square root of the construct correlations.

TABLE 5. Export and Import of Services

Variable	Fornell and Larcker					HTMT				
	1	2	3	4	5	1	2	3	4	5
IA	0.723									
ICS	0.734	0.715				0.803				
Profit	0.358	0.451	0.859			0.384	0.482			
ROE	0.372	0.481	0.727	0.929		0.424	0.544	0.823		
ROI	0.404	0.446	0.724	0.722	0.940	0.453	0.494	0.807	0.844	-

Note: compiled by authors

Further, all the values of the HTMT coefficients were significantly lower than the 0.85 cutoff (Henseler et al., 2015), which confirmed adequate discriminant validity for our measurement model.

Step 2: Testing the structural model. The hypothesized mediation role was tested through path analysis, and the structural model as found to be satisfactory, given that the collinearity issue was not a concern in the model.

IA explained R2 = 54% of ICS variation, whereas IA in conjunction with ICS explained R2 = 25.6% of the FP variation. The model controlled for company age and company size (number of employees) through dummy variables.

We focused on testing the influence of IA on FP through ICS based on responses to a Likert-type survey of 257 professionals employed as accountants, financial managers, financial controllers, financial auditors, and heads of internal audit units at a sample of KSA firms. Based on PLS modeling, provided in Figure 1, we found that IA significantly influenced FP and ICS, and that ICS, in turn, influenced FP.

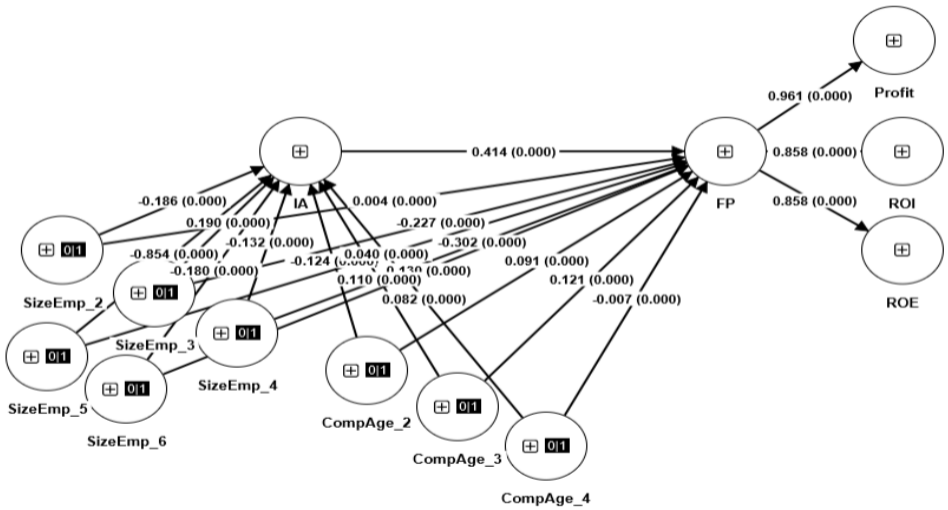

FIGURE 1. Path testing for structural model–direct influence (n = 257)

Note: compiled by authors based on calculations

We also tested the mediation role of ICS between IA and FP, which was found to be partial given that the indirect influence of IA on FP was stronger than the direct influence.

In more details, two models were examined, the first of which (Figure 1) tested the direct influence of IA on FP. The beta coefficient scored 0.414, which was significant as P = 0.000.

The findings suggest that with each incremental unit increase in IA, FP rises by 41.4%, thereby supporting H1. This aligns with previous research by Dahir & Omar (2016), Albkour & Chaudhary (2017), Alflahat (2017), and Simbiri et al. (2023), affirming a notable positive association between the two variables. Additionally, Dsouza and Jain (2021) also observed a positive correlation between IA quality and FP. The positive relationship underscores the role of IA in enhancing financial stability and fostering stakeholder confidence in management practices.

The path testing for the structural model is shown in Figure 2. In the second model, ICS is introduced as a mediator. As for the influence of IA on ICS, the beta coefficient was 0.735. This was significant as P = 0.000, given that as IA increases by 1 unit, ICS increases by 73.5%.

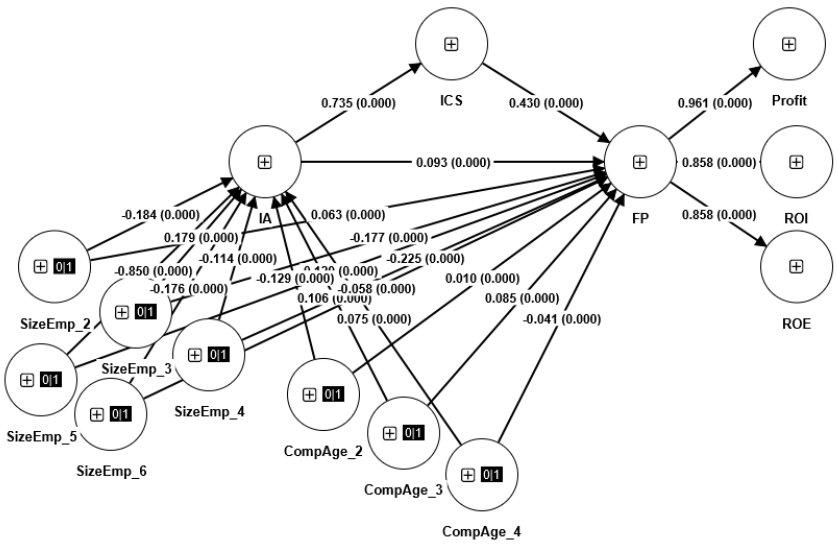

FIGURE 2. Path testing for the structural model (n = 257)

Note: compiled by authors based on calculations

Hence, H2 is supported. Our findings align with previous research by Hermanson and Rittenberg (2003), Harrington (2004), Badara (2013), Haron et al. (2014), Gwilliam (2014), Alzeban & Gwilliam (2014), Dsouza and Jain (2021), and Bshayreh et al. (2021). These studies emphasize the diverse roles played by internal auditors, such as providing leadership support, enhancing organizational values, formulating strategic plans, managing risks, and ensuring effective ICS operations.

Regarding the impact of ICS on FP, the beta coefficient recorded was 0.430, demonstrating significance with a P-value of 0.000. This significance implies that with a 1-unit increase in ICS, FP experiences a 43% increase, thereby providing strong support for H3. Our research aligns with previous studies. For example, Khamis (2014) and Kinyua et al. (2015) investigated the relationship between ICS and FP, revealing a significant positive correlation between the two variables. The findings emphasized a notable impact of ICS on FP, leading to the conclusion that companies should enhance their ICS to improve FP. Al Rahahleh et al. (2023) also found a significant

positive correlation between internal control and financial performance in their study. They highlighted financial accountability as a mediator in this relationship. Additionally, they indicated a direct positive influence of financial accountability on financial performance. In a study by Otoo et al. (2021), the focus was on finding out to which extent financial institutions worldwide depend on ICS effectiveness and efficiency for growth and development. The findings indicated a positive impact of all ICS elements, supporting the conclusions of Pickett (2010) and Steinberg (2011), who reported that these elements interact to form an integrated system crucial for the successful operation of enterprises.

In contrast, Ejoh and Ejom (2014) did not identify a direct and significant association between ICS and FP. However, their results underscored the essential role of an effective ICS in reducing theft. They found that IA can effectively detect and prevent fraudulent activities in public sector organizations.

Mediation was established ($0.735 \times 0.430 = 0.316$), and the indirect influence of IA on FP (IA ; ICS ; FP) was significant ($P = 0.000$). However, mediation was partial, as the direct influence when ICS was controlled for was still significant, given the beta value of 0.093 and given that $P = 0.000$. Hence, H4 was supported. The path estimates and hypothesis decisions are presented in Table 6.

TABLE 6. Path estimates and hypothesis decisions (n = 257)

H	Path	Beta	Decision
H1	IA → FP	0.414*	Supported
H2	IA → ICS	0.735*	Supported
H3	ICS → FP	0.430*	Supported
H4	IA → ICS → FP	Direct (0.093*) Indirect (0.316*)	Partial mediation

Note: complied by authors based on calculations
*$P < 0.05$

These findings should be considered by those in leadership roles at KSA firms. In efforts to improve financial performance, adequate IA possesses specific privileges and duties. Maintaining its autonomy can build more sophisticated and efficient ICS. Hence, the impact of a comprehensive and carefully executed IA goes far beyond checking accounts and financial statements. In fact, the process can, and should, entail establishing and supporting a system of financial control and accountability throughout the entire firm. This should be aligned with a well-established, companywide financial management philosophy, serving as a basis for strong accountability bolstered by meticulous record-keeping in support of realizing improvements in financial performance (Al Rahahleh et al., 2024). We also sought to identify indicators related to how the respondents view the independence and autonomy of the IA, as we proved that an independent IA has an influence on FP. To explore the respondents' positions in this regard, we asked them to indicate the extent to The literature consistently makes a case for the vital role of an independent IA in helping firms to maintain and improve their financial performance. Nonetheless, this potential relationship and its impact on FP has not been fully examined in the unique Saudi business environment and a growing capital market, particularly after the adoption of the Vision 2030. This study provides empirical evidence concerning the impact of IA on companies' FP. In addition, the literature on the relationship between IA and companies' FP did not examine the mediation role played by the ICS on the impact of IA on companies' FP. Hence, the broad aim of this study is to revisit this field of study and examine: (1) the impact of IA on FP; (2) the impact of IA on ICS; (3) the impact of ICS on FP; and (4) the impact of IA through ICS on the financial performance in the Saudi Listed Companies (SLC).

We proposed and examined two models. The first one (Figure 2) was designed to test the

direct impact of IA on FP, while the second model (Figure 3) was designed to test the possible role of Internal Control System (ICS) as a mediator factor between internal auditing (IA) and financial performance (FP). We have collected quantitative data through the survey instrument from professionals holding the positions of accountant, financial manager, financial controller, financial auditor, or head of an internal audit unit at a selected SLC. The result of our study supports the proposed two models. The study provides empirical evidence on: (1) a direct positive impact of IA on companies' FP, (2) a positive impact of the ICS on companies FP, (3) a positive impact of the IA on companies' ICSs, and (4) a mediation role played by the ICS between IA and companies' FP. Hence, an adequate independent IA certainly can improve ICS, through which stronger FP can accrue.

Based on the findings of this study, there is a clear opportunity to enhance the independence of internal auditors within SLC and allocate more resources towards strengthening the Internal Control Systems (ICS) to bolster financial performance. Additionally, providing additional training and development opportunities for IA professionals can amplify their contributions to both IA and ICS functions within the SLC, thereby enhancing governance within the companies, aligning with the objectives outlined in the Vision 2030 of the Kingdom of Saudi Arabia. Moreover, the refined model presented in this study sheds light on the mediation role played by ICS between IA and companies' financial performance, highlighting the potential for an independent IA to enhance ICS, consequently leading to stronger financial performance. As such, it is recommended that SLC management ensures the presence of an adequate independent IA, facilitating informed decision-making and accountability for financial performance, ultimately leading to more robust results.

Finally, the results of this study are associated with a limited number of SLC, and do not provide a full picture of the status quo of the impact of IA functions on companies' FP, particularly the mediation role played by the ICS between IA and FP. Therefore, future studies could be conducted to investigate these issues across more SLC.

AUTHOR CONTRIBUTION

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Green energy project management: applying industry-specific risk assessment models

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ABSTRACT

By reducing reliance on fossil fuels, green energy projects mitigate climate change by lowering carbon dioxide and other greenhouse gas emissions. They push governments and society to transition to renewable energy production by implementing high-risk green energy projects more effectively. This study evaluates how risk management processes affect the efficiency of green projects in Kazakhstan, identifying critical risk management processes that can increase their success. The methodology is based on data collected from 66 experts in Kazakhstan's green energy sector. Using multilinear regression analysis, the Project Management Body of Knowledge (PMBOK) standard was applied to evaluate the relationship between risk management processes and project efficiency dimensions. The findings show a positive correlation between cost overrun and project performance with the implementation of risk management processes. The statistical significance levels underscore the importance of these findings. The lack of statistical significance for schedule overrun, combined with the low rate of qualitative risk analysis and monitoring among local managers, highlights a deficiency in proactive risk management, leaving projects vulnerable to adverse impacts. These findings impact project management professionals and organizations involved in sustainable energy initiatives, providing valuable insights to enhance their risk management processes. This study paves the way for future research by adding more respondents and using other risk analysis methods, opening new avenues for improving risk management in green energy projects.

KEYWORDS: Economics and Business, Project Management, Risk Management, Green Energy Projects, Project Efficiency, PMBoK, Kazakhstan.

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1. INTRODUCTION

In the dynamic landscape of project management, the ability to identify, assess, and mitigate risks is crucial for ensuring the successful and timely completion of projects. Effective risk management becomes a priority as organizations increasingly engage in complex and multifaced green energy projects. Moreover, industry-specific risk analysis tools can help organizations tailor their risk management strategies to the unique challenges they face and discover best practices for mitigating risks that are specific to a particular industry (Carro et al., 2021). It's important to note that each industry has its own unique risks that need to be thoroughly analyzed and appropriately addressed in order to ensure the safety and efficiency of the processes.

Moreover, industry-related risks can not only hinder the success of the project but also block its potential progress and prosperity (Chebotareva et al., 2020). For instance, missed opportunities in cost reduction (planning and resource allocation) or innovation (lack of best practices on the market) could result. Thus, relevant risk management could give a business a competitive advantage. It can help one differentiate themselves or their organization by demonstrating a strong understanding of industry-specific challenges and solutions.

The risk assessment in the green energy industry differs significantly from other industries because it belongs to high-tech projects characterized by high risk and uncertainty levels and complex technologies. Unlike low-tech sectors, green energy projects involve assessing risks associated with resource variability, such as weather-dependent energy sources, or navigating evolving technologies and incorporating them to ensure their effectiveness (Choo&Go, 2022). It is also essential to consider risks considered in managing market volatility influenced by policy shifts and global events (Deng et al., 2014). The distinctive characteristics of green energy projects demand a specialized risk perspective to ensure effective risk mitigation and project sustainability. Therefore, this study aims to evaluate how risk management can affect the efficiency of green energy projects in the Republic of Kazakhstan.

By examining the existing risk assessment models, project managers in the green energy sector can gain a comprehensive understanding of the existing frameworks available to them. This overview will serve as a foundation for the subsequent sections, which will delve deeper into the application, challenges, and adaptations of risk analysis models in the context of the green energy sector.

Thus, the risk management processes from the PMBOK standard were used in terms of their ability to contribute to overall project success, specifically regarding budget and schedule overruns, as well as the project team's satisfaction with the project. The study identifies the critical risk management processes for project efficiency that can be used by project managers who run green energy projects.

The rest of the paper is designed as follows: Section 2 comprises a comprehensive literature review, thoroughly exploring prior research and the concept of risk assessment. Section 3 outlines the methodology for evaluating risks and introducing the techniques utilized in the process. Section 4 delves into the research outcomes and discoveries. Finally, Section 5 concludes the study with a summary of the research findings, identification of limitations, and suggestions for future research directions.

2. LITERATURE REVIEW

The green energy industry has unique challenges that stem from its dependence on rapidly evolving technologies, regulation, and the interconnectedness of global environmental issues. Unlike traditional low-tech industries, the green energy sector is often at the forefront of innovation, making it an ideal case study for the application of advanced risk analysis models. However, due to its distinctive characteristics and newly emerged manner, the

green energy sector also needs more extensive research in risk assessment. For example, it's identified that there are so many defects in the traditional ways of risk assessment when it comes to renewable energy investments and management (Escande et al., 2016). The authors have identified many uncertainties and suggested that studies on this topic can help investors and managers manage risk and reduce losses, which also benefits the development of the renewable energy industry.

Kozhakhmetova et al. (2019) compared the efficiency dimensions of green energy projects with those from other industries, including IT, communication, and nanotechnology. They identified cost overrun, schedule overrun, and project performance as key metrics. Nanotechnology projects showed the worst results, exceeding planned costs by 91.9% and schedules by 6.6%. The researchers attributed this underperformance to project complexity, risk exposure, and the infrequent use of project management. This highlights the importance of project and risk management in all high-tech projects, including green energy. Similarly, green energy projects showed a schedule overrun of 6.2% and a low-performance level of 7.5%. These findings indicate that green energy projects are not as efficient as expected, necessitating improvement efforts.

Several risk assessment models, such as Failure Modes and Effects Analysis (FMEA), Hazard and Operability (HAZOP), and Environmental Impact Assessment (EIA), are commonly used in project management for the green energy sector. These models help identify, analyze, and manage risks associated with complex projects like renewable energy and energy storage. Figure 1 shows a basic form of FMEA that identifies essential information to reduce or eliminate a root cause from a design and a process.

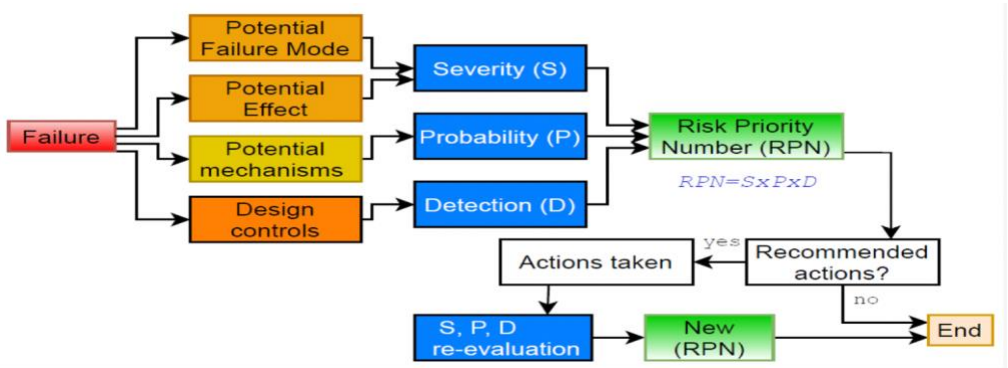

FIGURE 1. Typical FMEA pathway

Note: compiled by authors

FMEA and studies are mentioned in almost all literacy Foussard and Denis-Remis Hyett (2010) FMEA is a technique that "evaluates designs hazard and operability (HAZOP) and identifies potential failures and their probability of occurring". This type of analysis is fundamental for safe design, operation, and potential scaling up, all of which can be and are applied in the energy sector and widely used across all industries. The FMEA aims to eliminate potential failures or reduce their impacts. This analysis is built around three elements: the effect, the cause, and the detection. Figure 2 shows the initial list of items and the overall PRM process captured in the PMBOK Guide.

FIGURE 2. The PMBOK PRM process

Note: compiled by authors

The following tool that is widely used in risk assessment is HAZOP. Interestingly, a new version of HAZOP has been developed in the sustainable development sector: Green HAZOP or g-HAZOP. It initially emerged to recognize potential risks when working with highly harmful materials and abolish everything that can probably lead to a severe accident, such as explosions, fires, toxic releases, etc. Later, its use was expanded to other kinds of services due to its capability to recognize hazards and identify functional deviations from the preferred state (Li et al., 2021). Choo and have identified the HAZOP method as the most popular probabilistic-based risk assessment tool for energy and storage systems, which makes it highly relevant to this project of green energy (Liu&Zheng, 2017).

Another widely used risk assessment model is EIA. The main purpose of the EIA is to assess the possible impacts of an activity or a document on the environment and develop proposals for the prevention or minimization of negative effects (Marhavilas et al., 2020). The risk assessment part (ERA) of the EIA offers a more holistic assessment and enables the integration of environmental, social, and economic aspects. It also assists in prioritizing issues requiring management (Bennett, 2005).

In Figure 3 there is shown extended PRM process.

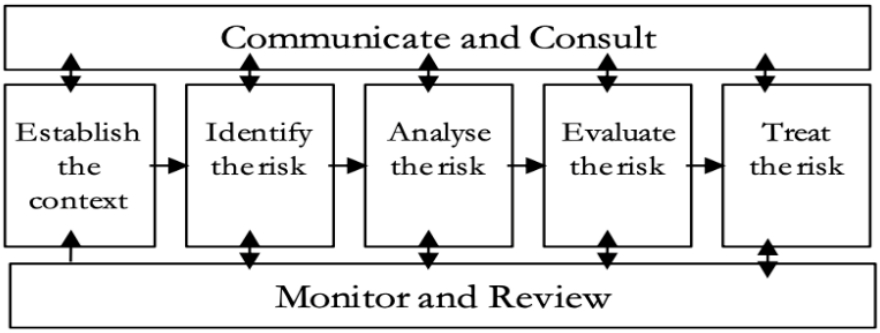

FIGURE 3. The extended PRM process

Note: compiled by the authors

Last but not least, the PRM (Project Risk Management) technique provides guidance concerning project development to ensure better resource management within the most common constraints (e.g., time, cost, and quality). Large organizations generally use published models, such as the CMMI (Capability Maturity Model Integration) or

PMBOK, the latter being the most well-known PM "best practices" reference (Mutlu & Altuntas, 2019).

The PMBOK PRM process from Figure 3 can be extended to incorporate two categories: "management support tasks" and "communication and inclusion practices" that encompass all PRM steps and were identified in the literature (Pegels et al., 2018; Pillay & Wang, 2003; Pritchard, 2001).

Despite being largely used, the above methods have also been longingly criticized (Pubule et al., 2012). All methods and tools have limitations, and the limitations of FMEA, HAZOP, and EIA will be studiedEven though FMEA is one of the most robust and widely used risk analysis methods, it has shortcomings. Those limitations in the decision-making processes include a need for more consideration of human factors and accuracy in determining risk priority number (RPN) (Robichaud, 2005; Roseke, 2018). The quality of the HAZOP analysis heavily relies on the knowledge and experience of the team conducting it. If the team lacks expertise or diversity, critical hazards may be overlooked. Moreover, as in FMEA's case, it has inaccuracy in weighting : it considers equivalent weights for the risk factors. It means that "low-probability and high-consequence" and "high-probability and low-consequence" hazards are approximately equivalent.

Overall, Escande's study of the current risk assessment methodology's limitations suggests that a root cause of the risks must be identified to identify the factors affecting project success (Shankar & Prabhu, 2001). Escande suggested closely investigating how risk analysis methods are implemented in real-time settings (observing the working teams) to understand better the conditions under which these methods are being used. Moreover, benchmarking has to be conducted by learning from past accidents. Lastly, a good fix could be adding another method to an existing one, as has been discussed earlier with FMEA and PMPQ. While HAZOP and FMEA are valuable for hazard analysis and failure mode assessment, they may provide a different level of coverage and adaptability to the risks and challenges faced in the green energy sector (Santos & Cabral, 2008). Generally, the literature review section compared existing risk management models like HAZOP, FMEA, PRM, and EIA and found PRM to be the most appropriate for green energy projects. This model is advantageous for green energy project management compared to HAZOP and FMEA. The model provides a more comprehensive risk assessment framework than HAZOP or FMEA, as it covers many risks relevant to green energy projects. Thus, the literature review helps to choose PRM as the most suitable for assessing the relationship between risk management processes and project green energy projects' success metrics. Moreover, specific project success dimensions such as project performance, cost, and schedule overrun were identified.

3. METHODOLOGY

Research design

This research aims to evaluate the Project Risk Management (herein PRM) model under PMBOK standard in terms of its ability to contribute to overall project success, specifically regarding budget and schedule overruns and the project team's satisfaction with the project. The model involves three main processes:

1. Risk identification and Evaluation (Planning stage);
2. Risk handling (Executing stage);
3. Risk controlling (Monitoring stage).

The PRM model entails a total of six processes, which are further categorized within the three processes mentioned earlier. The research model is depicted in Figure 4 below.

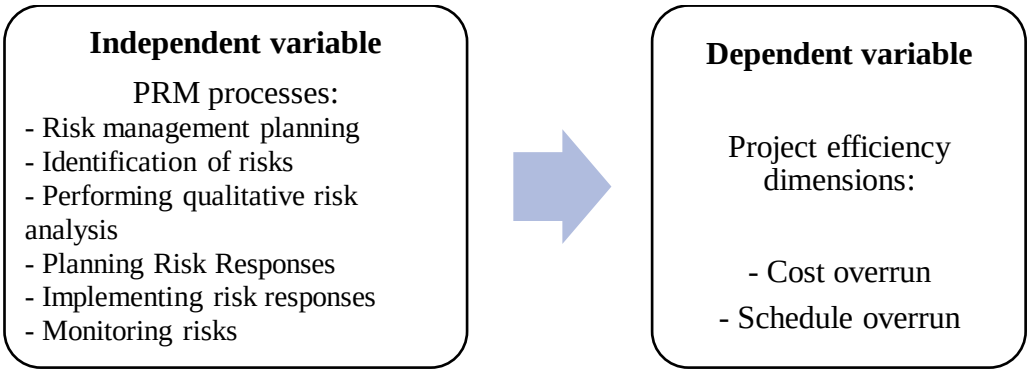

FIGURE 4. Research design

Note: compiled by authors

As shown in figure 4, this study, with its meticulous approach, will specifically focus on assessing the effectiveness of these six processes in managing the risks associated with projects in the green energy field. The success of the project's performance will be measured through key indicators such as cost overrun, schedule overrun, and the achievement of project goals.

Data collection

The survey was used as a data collection method as it allows to effectively gather necessary information for the research question in this paper. This data collection approach provided an unbiased basis for the examination of the results of this research. The online software called Google Data Forms was used for the conduction of the survey as it allowed for anonymous and fast data collection process. The participants answered 11 questions in relation to their project. Moreover, 100% of the questions were answered by the respondents.

Research sample

In Figure 5 there os provided data on the experience of respondents.

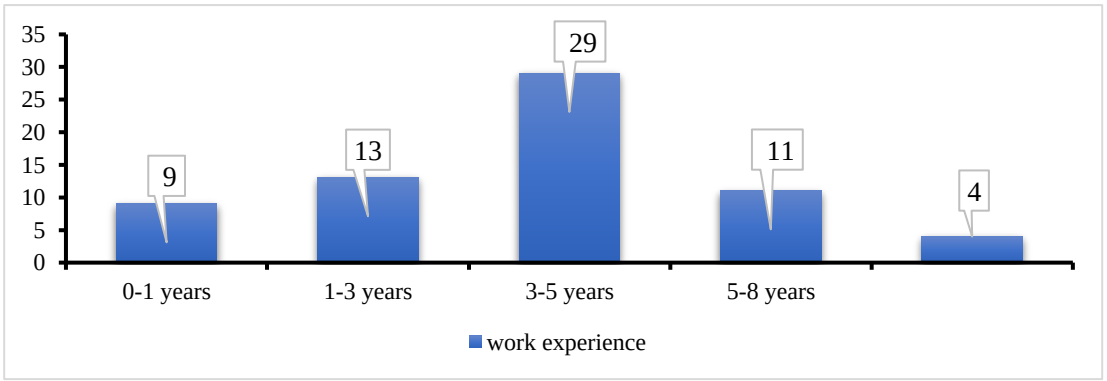

FIGURE 5. The work experience of the respondents

Note: compiled by authors

The survey was conducted among 66 participants that were either managers or leaders of the projects in the green energy sector. In order to identify projects in the green energy sector which could be enlisted in this research, the governmental companies such as “Baiterek Holding”, CGE as well as “Samruk Green Energy” were used as they entail lists of

green energy projects completed. The detailed description of the respondents' work experience is shown in Figure 5 below. This figure provides a snapshot of the distribution of work experience levels within the respondents, highlighting the varying levels of professional experience among surveyed project managers and supervisors. As shown in Figure 5, 44% have 3-5 years' experience in PM, while the most experienced respondents are 4 out of 66.

Data processing

The results were analyzed using multilinear regression analysis in Excel. The respondents were asked about the intensity of the six risk management processes used when executing green energy projects. They ranked it on a Likert scale from 1 to 5. Project success is evaluated by schedule and cost overruns, which are measured in percentages, and project performance is assessed by a Likert scale from 1 to 10.

4. RESULTS AND DISCUSSION

The analysis section provides the results of examining the PRM model within the projects in the green energy sector. Table 1 shows the overall analysis of the data collected in this study in the green energy field.

TABLE 1 – Data summary of the analysis in the green energy field

Measurement	P-value	R	Interpretation
Cost overrun	<0.001	0.41	Existing correlation, high significance
Schedule overrun	>0.05	0.15	Low correlation, low significance
Project Performance	<0.001	0.57	Existing correlation, high significance

Note: compiled by authors

As can be seen from Table 1, the results for Cost overrun and Project performance have been calculated to correlate with the implementation of Project Risk Management processes and high statistical significance levels. For instance, Cost overrun (R=0.41) and project performance (0.57) have a statistically significant positive correlation with risk management processes, meaning that project budgeting and performance improvements are associated with proper risk management tactics. The results in Figure 6 describe the average percentages of cost overrun and schedule overrun for selected projects.

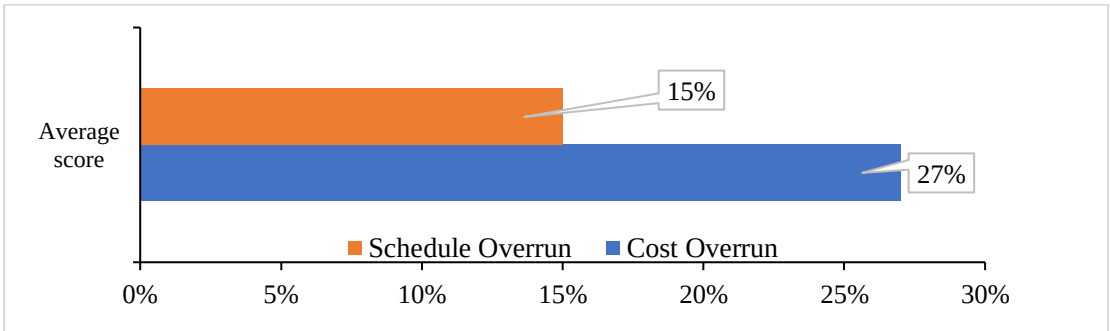

FIGURE 6. The average scores for Cost Overrun and Schedule Overrun

Note: compiled by authors

As shown in Figure 6, Cost Overrun indicates that, on average, the projects or tasks are experiencing a cost increase beyond their initially estimated budget. Specifically, projects are running, on average, 27% over budget in terms of costs. The score of Schedule Overrun (15%) suggests that the projects or tasks are taking longer to complete than

initially planned or scheduled. Projects are, on average, delayed by 15% beyond their original timelines. These metrics help to assess how well projects are adhering to their planned budgets and schedules. High percentages in either category can indicate inefficiencies or unexpected challenges in project execution.

The statistics results for the Cost overrun, Schedule overrun measurement and Project performance are presented below in Table 2.

TABLE 2 – Detailed description of the Cost overrun indicators, Schedule overrun, Project performance

Dimension	N	Multiple R	Coefficient	F significance
Cost overrun	66	0.4	-25.13	0.00063
Schedule overrun	66	0.2	-1.86	0.22
Project performance	66	0.57	1.32	4.67156E-07

Note: compiled by authors

The table shows that the coefficient for PRM for Cost Overrun is -25.13, which means that as PRM increases, the Cost overrun decreases. As projects carry out the PRM processes, they decrease the likelihood of overspending the project budget. Moreover, the significance level of the F-test for the regression model shows a very low p-value equal to 0.000637, which means that the results are statistically significant. The analysis shows that the coefficient for PRM for Schedule. Overrun is -1.86, which means that the intensive use of risk management processes decreases the Schedule overrun. Moreover, the P-value for the PRM is at a significance level of 0.22, which means that the results are not very statistically significant. It can be seen from Table 4 that the coefficient for PRM for Project performance is 1.32, which means that the active use of risk management processes positively impacts the reaching of the goals and aims of the project. Moreover, it can be seen that the P-value for the PRM is at the level of significance of 0.0000000467, which means that the results are statistically significant. The average of the 7 project risk management processes for each project was calculated, and its relation to each of the three measurements of the project's success has been calculated. Table 5 illustrates the exact project risk management processes that were analyzed in this study.

TABLE 5 – Project Risk Management processes

Project Risk Management Process	Average indicator across projects
Risk management planning	4.72
Identification of risks	3.90
Performing qualitative risk analysis	2.51
Planning Risk Responses	4.15
Implementing risk responses	2.66
Monitoring risks	2.59
Evaluation of cost and budget	4.04

Note: compiled by authors

It can be seen from Table 5 that the risk management planning process, on average, was performed on a higher level at 4.72 out of 5. Meanwhile, the qualitative risk analysis and monitoring were performed on an average lower level across 66 projects examined in this study. Thus, the study assumes that more attention should be paid to risk monitoring and qualitative risk analysis. This may be due to the low level of project managers' experience and qualifications in using monitoring and analytical tools. A low rate of qualitative risk analysis and risk monitoring indicates a deficiency in proactive risk management, leaving the project more vulnerable to adverse impacts. Table 6 outlines the Project Risk Management Process along with corresponding outcomes in terms of Cost Overrun, Schedule

Overrun, and Project Performance. The results with a p-value equal to or lower than 0.05 and 0.001 were chosen as necessary. Risk management planning, risk identification, risk Monitoring, and cost and budget evaluation are critical processes for cost overruns, while schedule overruns are impacted by only risk management planning and monitoring risks.

TABLE 6 – Identifying the critical PRM processes for efficiency dimensions

№	Project Risk Management Process	Cost Overrun	Schedule Overrun	Project performance
1	Risk management planning	+	+	
2	Identification of risks	+		+
3	Performing qualitative risk analysis			+
4	Planning Risk Responses			
5	Implementing risk responses			+
6	Monitoring risks	+	+	
7	Evaluation of cost and budget	+		+

Note: compiled by authors

Four PRM processes listed in Table 6 also impact project performance. These findings mean that derived processes may directly increase the appropriate dimensions of project efficiency. Therefore, project managers should focus on them when running their projects because each of these processes has its own tools and techniques. The results show that using proper risk management processes can decrease the cost overrun by supporting the planned budget. In addition, managers may perform projects better if they use project risk management processes from the PMBoK standard.

5. CONCLUSION

The study aimed to evaluate the relationship between risk management processes and project success dimensions in the Republic of Kazakhstan's green energy field. A comparative assessment of existing risk analysis models identified PRM within the framework of PMBOK as the most suitable methodology. According to the results of this research, performing risk analysis processes statistically significantly increases the likelihood of achieving the project's goals and reduces the chances of going over the budget. Also, it can be said that performing PRM results in the elimination of cost overrun issues and an increase in the chances of project goal achievement; however, meeting the deadlines – those results cannot be accounted for by the general population. Therefore, project managers running green energy projects should look for additional measures to decrease the schedule overrun. It's suggested that the schedule management knowledge area be performed based on the PMBoK standard, which focuses on managing the project schedules. Moreover, the low rate of qualitative risk analysis and monitoring processes revealed that these essential risk management activities are not conducted frequently or effectively within a green energy project. The study suggests using risk management software for purposes like Risk Cloud, Vendor 360, and Project Risk Manager, which can help monitor and perform a risk analysis. The study has several limitations connected with sample size, methods used, and the quantity of variables. The research covers only 66 respondents due to the small size of the green energy market in the Republic of Kazakhstan and, accordingly, the supervisors who run such projects. Therefore, future research may expand this study by increasing the number of respondents from other industries. Further research may also use other risk analysis models and choose an additional list of variables.

AUTHOR CONTRIBUTION

Writing – original draft: Kozhakhmetova A., Anarkhan A.
Conceptualization: Kozhakhmetova A., Anarkhan A.
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Funding acquisition and research administration: Kozhakhmetova A.
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Software and supervisions: Anarkhan A.
Data collection, analysis and interpretation: Anarkhan A.
Visualization: Kozhakhmetova A., Anarkhan A.
Writing review and editing research: Kozhakhmetova A.

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