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Original Research

Manufacturing industry potential of the Kyrgyz Republic in Eurasian economic integration

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Abstract

The Kyrgyz Republic, as a developing country with a socialist past, has great opportunities for further economic development. An important factor to consider is the growth of the manufacturing industry, which highlights the significance of analyzing this sector within the country. This study centers on the potential contribution of the Eurasian Economic Union (EAEU), of which Kyrgyzstan is a constituent, towards the advancement of this industry. The research aimed to evaluate the current manufacturing capacity of the Kyrgyz Republic in the industrial sector and to comprehend the influence of the EAEU on industry growth. The main methods that were used during the writing of the research were analysis, forecasting, abstraction, and historical analysis. The work analyzed the industrial sector of Kyrgyzstan within the framework of its integration into the EAEU. The research assessed the historical background of Kyrgyzstan's accession to the EAEU and the subsequent harmonization of national legislation with the provisions and requirements of the union. In addition, data comparing the industrial production and growth rates of Kyrgyzstan, Armenia, and Kazakhstan have been presented, highlighting notable trends and differences. The work examines specific components of the manufacturing industry of the Kyrgyz Republic, the manufacture of food, beverages, and tobacco products; rubber and plastic manufacture, and non-metallic mineral goods; manufacturing of basic metals and metal products (excluding machinery and equipment); and supply of electricity, gas, steam, and conditioned air. It also talks about the manufacturing sector's importance in Kyrgyzstan, current trends, and possible future improvements, and it enables the assessment of the country's involvement in the EAEU.

Keywords: Economic development, International relations, National policy, Developing countries, Economic growth

1. Introduction

The significance of manufacturing in the economic expansion of any nation is important [1, 2]. Similar to other industries, it exerts a favorable influence on a nation's economic expansion, job creation, and trading capacity. The manufacturing sector enhances the value-added of goods and entices investment, hence fostering the growth of the national economy [3-7]. In addition, its development, even if a country does not have special conditions to specialize in it, leads to increased diversification of the economy, which allows for more sustainable economic development. In addition, the manufacturing industry establishes opportunities for the production of goods that can be exported to international markets, which helps to increase foreign trade and improve the trade balance of the country [8-11].

The manufacturing sector is a crucial industry in the Kyrgyz Republic. The country, having huge potential in the industry, is interested in securing its qualitative development [12, 13]. In the conditions of the modern global economy, the country is increasingly oriented towards the development and strengthening of economic ties with other states. Participating in regional economic integration procedures is a highly effective method to attain this objective. In this context, the Kyrgyz Republic, seeking to strengthen its position on the world stage, is actively participating in the Eurasian Economic Integration (EAEI) or the Eurasian Economic Union (EAEU) [14, 15]. It will allow both to achieve the purposes already listed above and to attract additional investments, which in turn will enable both to increase production volumes and to improve the technological potential of the industry, making its products more competitive in the international arena [16-22]. Therefore, a more detailed consideration of both the manufacturing industry of Kyrgyzstan and its interaction with the EAEU remains relevant.

[23] considered what structural features are currently observed in the economy of the country and how it can affect its future state. The economic structure of the Kyrgyz Republic is currently typical of the economies of underdeveloped countries and is characterized by a large share of industries with low value-added or diminishing returns, insufficient growth rates of new jobs, and low demand for skilled labor [23]. Nevertheless, it is worth mentioning that all these deficiencies may be resolved by fostering the growth of the industrial sector in the economy [24-29]. In turn, the factors affecting the economic development of the country, namely its level of gross domestic product (GDP), were assessed by [30]. The plan intends to encourage economic growth and support the resuscitation of the country's economic development by concentrating on entrepreneurship, trade, and investment attractiveness, with special emphasis on the development of the industrial sector. Some characteristic features of the internal economic condition of the country, particularly in terms of entrepreneurial activities, were explored by [31]. In turn, the problems and causes of poverty and political instability in the country were assessed by [32]. The scientist noted that despite the huge amount of resources on the territory of the country, it cannot adjust their delivery and use effectively enough to ensure its qualitative development, which is the main cause of all economic and political difficulties (she called this phenomenon "resource curse"). [33] examined the influence of the national policy of Kyrgyzstan on the country's economic prosperity. They discovered faults made by the authorities during the execution of this strategy.

2. Materials and methods

The study analyzed the production volumes of the manufacturing industry in the Kyrgyz Republic, with a specific emphasis on various sectors including food, beverages, and tobacco production; rubber and plastic product manufacturing; basic metals and finished metal product production. It also examined the supply of electricity, gas, steam, and conditioned air, as well as the generation of electricity, gas, steam, and conditioned air. As a comparison, it was decided to choose some EAEU countries, namely Kazakhstan and Armenia, which share some common characteristics related to their common past within the Union of Soviet Socialist Republics (USSR) (similar demographic characteristics, close trade links with other countries in the region, existing dependence on world commodity prices and global economic factors).

During the research, information from various sources providing statistical data was used. The main among them was the National Statistical Committee of the Kyrgyz Republic, which provided basic information on industrial development in the country, and the Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, which provided data on the manufacturing industry in Kazakhstan respectively, and the Statistical Committee of the Republic of Armenia to provide information on the country. Information provided by selected international organizations, in particular The World Bank [34], was used. These data were used to estimate the level of GDP of these countries and then compare it with the level of industrial output. All calculations and constructions were performed in Microsoft Excel.

The approach that was chosen during the work was systematic. It facilitated the examination of specific variables that impact the manufacturing industry's potential by establishing a cohesive framework that enables their interplay. One of the main methods that was used during the research was analysis. It allowed estimating the potential of the manufacturing industry based on the available data sets about it; it allowed drawing important conclusions within the framework of the research. In addition, the historical method was utilized to assess the trends relevant to the manufacturing industry in the country based on historical data, that is, retrospectively. Abstraction, in turn, enabled the disregard of specific elements that influence the manufacturing industry in the country but do not have a substantial impact on it. Forecasting, however, enables the estimation of the industry's prospects for its relationship with the organization. The quantitative analysis was used to examine the data in terms of industrial output in the countries, including individual groups of these goods. For their assessment, the method of comparison was used, which allowed a more objective assessment of the relevant values of the development of the manufacturing industry. Qualitative analysis was used to assess such data that could not be presented in the form of numerical values.

3. Results and discussion

In general, the interaction between Kyrgyzstan and the EAEU started back in 2010, when the country expressed its intention to join the customs union. The country's accession to the EAEU was seen as an important step to develop economic ties and strengthen integration processes in the region. However, this process took quite a long time. In 2011, Kyrgyzstan signed the Protocol of Accession to the Customs Union and agreed on the Schedule of Accession to the EAEU. Subsequently, the process of aligning the national legislation with the provisions and requirements of the EAEU commenced. The relevant international documents signed by the Kyrgyz Republic and other members of the association came into force. Only from that moment, the country became a full-fledged part of the EAEU. Figure 1 displays data on the aggregate volume of industrial production in the Kyrgyz Republic in comparison to Kazakhstan and Armenia.

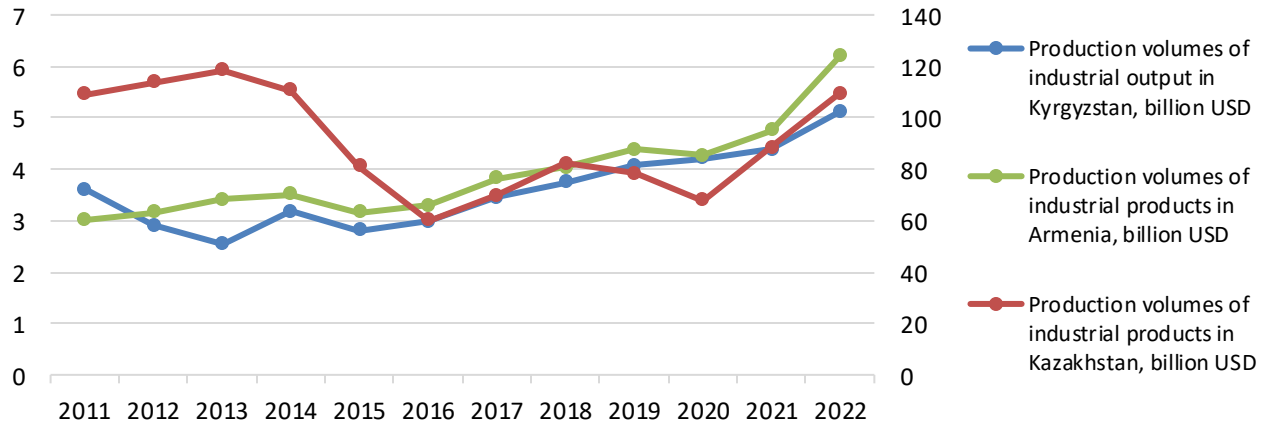

Figure 1. Industrial output in Kazakhstan, Armenia, and Kyrgyzstan in the period from 2011 to 2022

Note: data have been aggregated to a single currency (dollar) for ease of comparison; aggregation is based on monthly average exchange rates for each of the national currencies (tenge and som, respectively).

As can be seen from Figure 1, Kyrgyzstan and Kazakhstan have rather different volumes of industrial production; while the volumes are similar in Armenia and Kyrgyzstan. Furthermore, there are discernible patterns in the fluctuations in output volume across the countries; in Kyrgyzstan and Armenia, there is a tendency for it to rise, but in Kazakhstan, there is a tendency for it to decline (Figure 2).

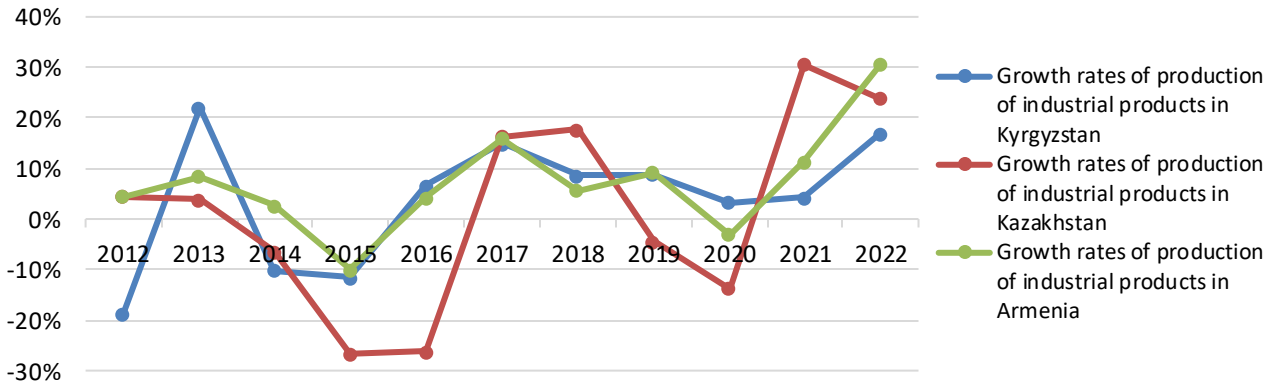

Figure 2. Industrial output growth rates in Kazakhstan, Armenia, and Kyrgyzstan from 2012 to 2022

As can be observed from Figure 2, the growth rates of industrial output in both countries varied quite a lot depending on the selected year. It is difficult to determine directly from Figure 2 which country has been more successful in this area. Nevertheless, by calculating the average growth rate of industrial production one can understand that Kyrgyzstan has been relatively successful (its growth rate is about 3.35% on average per year, while Kazakhstan's is 0.0003% (i.e. the volume of production in absolute terms has not changed much, which can be observed in Figure 1), and Armenia's is 6.78% (very high growth rate; twice as high as Kyrgyzstan's). Even more effective conclusions can be drawn if the role of industrial production in the production of countries in terms of the ratio to GDP is considered, which is demonstrated in Figures 3 and 4.

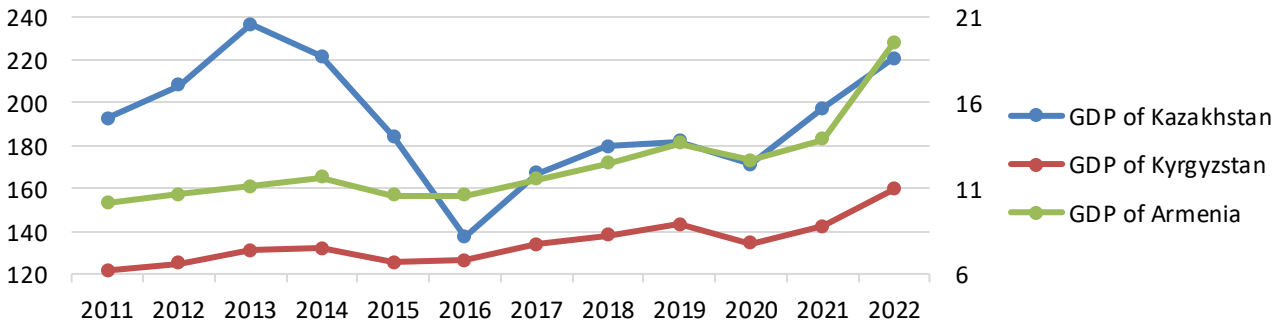

Figure 3. GDP of Kazakhstan, Armenia, and Kyrgyzstan in the period from 2011 to 2022, billion USD [34]

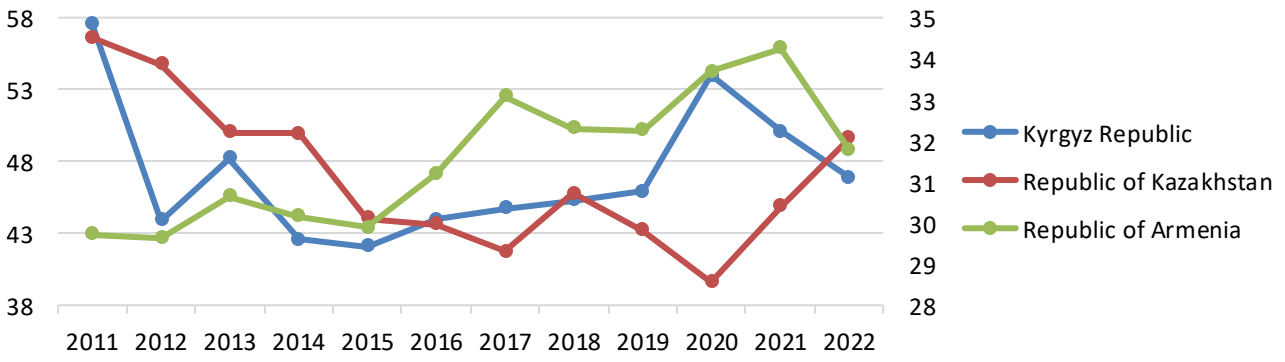

Figure 4. Ratio of industrial output to GDP of Kyrgyzstan, Armenia, and Kazakhstan from 2011 to 2022, % [34]

Despite significant differences in GDP levels, the ratio of industrial output to GDP in Kyrgyzstan and Kazakhstan is similar and ranges from about 40% to 58%, while in Armenia the ratio is between 29% and 35%. As of 2022, the value of output was higher in Kazakhstan compared to Kyrgyzstan, but taking the annual average value of this indicator (46.98% for Kyrgyzstan, 47.08% for Kazakhstan) it can be observed that it is still slightly higher for Kyrgyz Republic. Armenia lags in this context, which is primarily due to the role of raw material extraction in the country and the agrarian sector. Thus, Kyrgyzstan has sufficient growth rates of production compared to other members of the association: they remain higher than in Kazakhstan but lower than in Armenia, the growth of production which can be explained by a low initial base (as evidenced by a small role in GDP). The data on the share of manufacturing in the Kyrgyz Republic in GDP are particularly relevant (Figure 5).

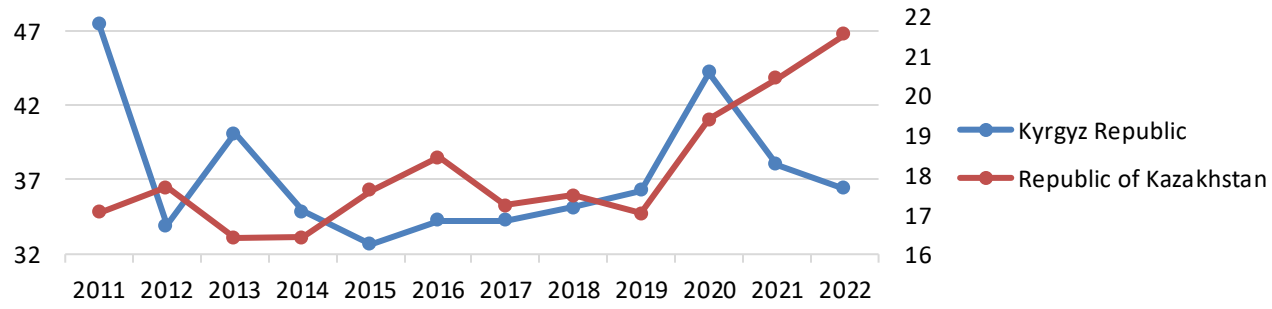

Figure 5. The percentage contribution of the manufacturing industry to the GDP of Kyrgyzstan and Kazakhstan from 2011 to 2022 [34]

Figure 5 demonstrates that the manufacturing sector contributes significantly to Kyrgyzstan's GDP, ranging from 47% to 33%. In contrast, Kazakhstan's manufacturing sector has a much lower contribution, ranging from 16% to 21.5%. The data suggests that the manufacturing industry in the nation has reached a pretty high degree of development. However, its contribution to the GDP has been decreasing over time. Nevertheless, this does not always imply a bad connotation, since the service sector's significance in the nation is progressively growing, indicating its quality advancement. The research's findings, which show the manufacturing industry's continued growth, are proof of this. In addition, it is important to consider some of the individual components that comprise the manufacturing industry. There are quite a few such subgroups of manufacturing, but only four (which occupy the largest share in the production of the Kyrgyz Republic) will be considered in this research: production of food, beverages, and tobacco products, rubber and plastic manufacture, and non-metallic mineral goods, production of basic metals and finished metal products, except machinery and equipment, and provision (supply) of electricity, gas, steam, and conditioned air. Absolute data of these values for Kyrgyzstan and Kazakhstan are presented in Tables 1 and 2.

Table 1. Volume of industrial output in the manufacturing industry of the Kyrgyz Republic in absolute values in 2011-2022, billion USD

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Food, beverages, and tobacco products	0.41	0.45	0.47	0.46	0.36	0.37	0.46	0.46	0.48	0.46	0.54	0.75
Rubber and plastic, and non-metallic mineral goods	0.21	0.27	0.36	0.32	0.25	0.21	0.26	0.31	0.31	0.25	0.35	0.41
Basic metals and metal products	2	1.15	1.77	1.5	1.28	1.45	1.55	1.69	2.09	2.51	2.18	2.49
Provision of electricity, gas, steam, and conditioned air*	0.53	0.5	0.46	0.44	0.48	0.46	0.52	0.56	0.53	0.49	0.5	0.53

*Note: * – is not a component of the manufacturing industry.*

Table 2. Volume of industrial output in the manufacturing industry of Kazakhstan in absolute values in 2011-2022, billion USD

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Food, beverages, and tobacco products	5.67	5.85	6.44	6.59	6.1	4.56	4.67	4.61	4.56	4.91	5.38	6.89
Rubber and plastic, and non-metallic mineral goods*	2.61	3.1	3.63	3.64	3.22	1.98	2.24	2.34	2.34	2.48	3.08	3.73
Basic metals and metal products	0.85	0.97	1.17	1.07	0.96	0.74	0.72	0.72	0.71	0.73	0.79	0.89
Provision of electricity, gas, steam and conditioned air**	6.06	6.74	7.42	7.23	6.83	4.35	4.84	5.11	4.17	4.36	5.06	5.22

*Note: * – the category "Rubber and plastic manufacture, and non-metallic mineral goods" for Kazakhstan was established from two other categories, namely "Manufacture of rubber and plastic products" and "Manufacture of other non-metallic mineral products" due to differences in the methodology of accounting for manufactured products of the industrial sector in the country compared to the Kyrgyz Republic; ** – is not a component of manufacturing industry.*

According to Table 1, the manufacturing of basic metals and metal products (excluding machinery and equipment) is the leading industry in terms of industrial output in the Kyrgyz Republic. However, it should be noted that in Kazakhstan, the primary industry is "crude oil and natural gas extraction," which is not included in Table 2. This is because, while it is rather sizable, it is not as crucial to the nation as the other four sectors that were chosen. Moreover, it is important to note that Kyrgyzstan's increase in production is apparent in all sectors, showing a very promising pattern. Table 3 displays a juxtaposition of the rates of expansion in industrial production between the Kyrgyz Republic and Kazakhstan.

Table 3. Estimation of relative and absolute differences between separate industrial production indicators of Kazakhstan and the Kyrgyz Republic

Indicator	Growth rate		Absolute difference in growth rates, p.p.	Relative difference in growth rates, %
	Kyrgyzstan	Kazakhstan		
Manufacture of food, beverages, and tobacco products	5.52	0.05	5.47	11026.06
Rubber and plastic manufacture, and non-metallic mineral goods	6.11	1.789	4.32	241.33
Manufacturing of basic metals and metal products (excluding machinery and equipment)	2.03	3.28	-1.26	-38.29
Provision (supply) of electricity, gas, steam and conditioned air*	0.136	0.42	-0.29	-67.73

*Note: * – is not a component of the manufacturing industry.*

Absolute values in the growth rates of the first two categories (manufacture of food, beverages, and tobacco products and rubber and plastic manufacture, and non-metallic mineral goods) in the Kyrgyz Republic are quite high, due to the level of outperformance of Kazakhstan in this area is very high (as in the case of the first category by more than 11,000%) (Table 3). Although the main industries in the Kyrgyz Republic have already been analyzed above, for clearer conclusions it would be better to consider all of them. For this purpose, consider their growth rates, which are presented in Table 4.

Table 4. Growth rates of individual industries in the Kyrgyz Republic in the period from 2012 to 2022, %

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Average
Manufacturing of basic metals and metal products (excluding machinery and equipment)	-40.77	55.54	-4.61	1.57	23.25	5.34	8.93	25.5	33.14	-5.23	12.48	7.64
Manufacture of food, beverages, and tobacco products	10.87	5.82	11.2	-6.87	12.02	22.55	0.23	6.02	4.7	28.96	36.05	11.33
Rubber and plastic manufacture, and non-metallic mineral goods	30.13	35.74	0.3	-5.67	-11.8	23.77	20.48	0.29	-9.35	53.15	13.15	11.95
Textile manufacture; manufacture of clothing and footwear, leather, and other leather goods	23.29	-10.91	-28.1	-12.03	22.27	2.27	39.14	5.09	-21.31	-0.52	24.72	1.98
Production of coke and refined petroleum products	3.87	-7.57	269.65	104.12	22.4	40.13	17.62	-60.37	-77.01	214.3	66.08	19.27
Other production, repair, and installation of machinery and equipment	10.59	12.35	0.97	-9.47	9.08	2.41	23.51	4.22	2.96	36.59	39.09	11.14
Manufacture of wood and paper products; printing activities	26.5	-5.44	6.84	1.21	-1.08	-4.78	11.85	0.36	-7.8	30.43	22.52	6.58
Manufacture of electrical equipment	6.55	11.22	21.44	-4.56	-13.03	-11.73	9.72	-2.08	-15.2	21	39.48	4.49
Manufacture of vehicles	32.76	28.27	-26.66	-18.64	49.11	31.34	-19.6	45.27	-11.25	25.44	-4.99	8.52
Manufacture of pharmaceutical products	28.25	8.6	11.98	31.17	5.78	76.6	-35.48	38.62	102.61	9.58	-8.05	19.32
Production of chemical products	29.52	-11.47	4.18	-35.97	-10.54	-13.11	51.55	-16.75	-3.37	10.24	-12.09	-3.16
Manufacture of machinery and equipment not included in other groupings	15.15	11.94	19.26	-31.27	-19.83	65.75	-33.08	11.22	-42.41	118.03	-27.05	-0.4
Manufacture of computers, electronic and optical equipment	29.21	-19.86	8.21	-7.17	48.33	-35.59	-48.68	57.75	15.64	20.43	-27.72	-1.9

The manufacture of food products, rubber and plastic manufacture, and non-metallic mineral goods are really large industries, which indicates that they are the main ones to pay attention to and promote their development. Nevertheless, they are not high-tech, which is very significant in modern realities [35, 36]. The production of

pharmaceutical products and other production, repair, and installation of machinery and equipment should be addressed by the state, as they can bring a lot of benefits to the country in the long term [37-43].

The manufacturing industry in Kyrgyzstan is now demonstrating encouraging prospects for expansion and advancement. It is poised for development in the nation due to its advantageous geographic location, integration with the EAEU, beneficial laws, and the presence of an expanding labor force [44, 45]. To ensure sustained economic growth in the future, Kyrgyzstan can leverage its productive capacity and make strategic investments in important industries while prioritizing the development of its human capital. It will greatly enhance the future progress of the state and the standard of living of its citizens.

The significance of industrial policy in fostering structural change and stimulating output growth in developing countries has been described by [46]. The scholars write that the focus of industrial policymaking should be primarily on improving the effectiveness of existing policy instruments and developing new ones that consider factors such as entrepreneurship, level of development, and evolving public-private relations. In this context, developing countries can greatly benefit from the literature and experience of foreign countries in the development of such policies [47]. Gaining a comprehensive understanding of the current dynamics is essential for the creation of new industrial policy tools and the efficient implementation of existing ones. Scholars suggest that there is a high significance of industrial sector development in achieving better outcomes in terms of economic development, especially considering the new existing policy instruments in this area. [48] evaluated the contribution of the industrial and service sectors to economic growth in the research. According to the researcher, there was previously widespread agreement that manufacturing played a vital role in growth. However, there is now an increasing acknowledgment of the significance of service sectors [49-51]. Through a comprehensive examination spanning from 1950 to 2015, he establishes a clear correlation between the proportion of manufacturing activities and economic expansion, particularly in less affluent nations. Manufacturing plays a crucial role in times of rapid economic expansion, but the services sector has also contributed to growth, albeit to a lesser degree [52, 53]. In general, the findings corroborate the premise that manufacturing significantly contributes to economic development, particularly during periods of rapid expansion, as highlighted several times in the aforementioned study on the development of the Kyrgyz Republic [54-57].

In addition, the role of industry has been assessed by [58]. The author stated that industry serves as the foundation for the economic advancement of a nation and the progress of society. It supports both the agricultural sector and the service sector; states that have a more developed industrial sector are richer than others [59-64]. As for developed countries, which are characterized by an increasing role of the service sector and a decreasing role of industry, there are certain specific features. Firstly, their production capacity may be located in other countries due to globalization; secondly, although the relative role of industry is declining, its capacity as such continues to increase and modernize [65-68]. Thus, the role of industrial production remains significant. The impact of manufacturing on a country's economic development, especially emphasizing its effect on the service sector, savings incentives, technological accumulation, and exploitation of human capital and economic institutions, has been explored by [69]. Their emphasis lies on the need for industrial strategy in averting early deindustrialization, particularly in the age of globalization, to maintain sustained economic growth in emerging nations [70-73]. The scholars suggested extending the period of industrialization in the states, as they believe that such a model would achieve better long-term economic outcomes than one that is service-oriented.

The significance of industry for the development of the economy has been explored in [74]. They indicated that standard macroeconomic models do not value this component highly enough, downplaying its significance since in modern realities much more attention is paid to the service sector. These researchers suggest several approaches for analyzing the function of this component in macroeconomics, namely by examining subsectors and production activities at various levels, taking into account the evolving nature of production systems and their worldwide production networks. Understanding the relative importance of different manufacturing

industries and the technical connections that arise within manufacturing is essential for comprehending a country's capacity for technological advancement [75, 76]. It is particularly relevant for the Kyrgyz Republic, which has a clear purpose to develop in an intensive rather than extensive way [77, 78]. The extent to which manufacturing and sustainable development are compatible was assessed by [79]. Their findings indicate that the growth of manufacturing is essential for the advancement of advanced producer services and industrial modernization. The manufacturing industry is fostered through various forms of collaboration and diverse approaches to the relationship between manufacturing and services [80-82]. Manufacturing is a crucial element of production services and significantly contributes to a country's economic sustainability [83].

The disadvantages and positive components of the EAEU were assessed by [84]. The research highlights the problems and shortcomings of the EAEU in achieving the stated purposes of economic integration. The author emphasizes Russia's dominant role in integration processes, using the EAEU for its political and strategic interests while limiting benefits for other member states. The purposes and interests of member states in economic issues and expectations of small states of benefits do not coincide with Russia's approach. The scholar accused the country of double standards, imposing trade barriers and restrictions on existing members and granting concessions to new members [85-87]. The research concludes that the situation is unlikely to improve given the ongoing sanctions and the challenges facing the Russian economy; suggesting that the existing difficulties in interactions between the countries will continue. While acknowledging the country's economic gains, particularly in the manufacturing sector, it is worth noting that these advantages may have been more substantial if the EAEU members had adopted more favorable policies towards one another within comparable associations [88-90]. Notably, other scholars [91] mentioned the existing inefficiencies in the context of the EAEU functioning.

Based on the information analyzed above regarding the economic development of the manufacturing industry in the Kyrgyz Republic, it is possible to provide some advice on how to secure more effective national policy in this area. Thus, the focus should be on the development of industries beyond their current core sectors; the research has described those areas that are particularly important for policymakers to pay attention to. Particular attention should be paid to sectors related to high-tech technologies, such as pharmaceuticals and mechanical engineering [92-95]. Furthermore, providing assistance to small and medium-sized firms and creating a conducive climate for their functioning can serve as a potent component of national strategy. This includes providing access to finance, improving business regulations, and providing various public services [96-98]. These actions, in general, can enhance the growth of any sector of the economy, rendering it more competitive and efficient. In addition, it is recommended to increase investment in human capital, in particular, professional training; the government should give priority to education and training programs to increase the employability of the population [99]. The same applies to investment in infrastructure (transport networks, energy systems, and digital connectivity). It is more efficient to simplify the possibilities for foreign investments to flow into the country, and trade processes. By adopting this approach, the government can ensure more streamlined economic growth for the overall economy, with a specific focus on the industrial sector.

4. Conclusions

The Kyrgyz Republic's accession to the EAEU has provided opportunities to expand its market and attract foreign investment. Membership in the country facilitates entry into a significant consumer market and fosters the alignment of standards and laws, hence supporting the expansion of the manufacturing industry. Since becoming a member of the organization, Kyrgyzstan has exhibited favorable upward trends in industrial production. The country has achieved a higher rate of advancement compared to Kazakhstan, with an average yearly growth rate of around 3.35%, but a lower rate compared to Armenia. This suggests that there is a possibility for more growth and expansion of industrial output in the Kyrgyz Republic.

Examinations of individual sectors within the manufacturing industry, such as food processing, rubber and plastic goods, basic metals, and energy generation, reveal the substantial contribution of these sectors to

Kyrgyzstan's industrial production. The growth of production in these categories is a positive sign and indicates the potential for further development. Also, it is crucial to highlight the importance of advanced sectors such as medicines, machinery, and equipment. These sectors have exhibited promising growth prospects and possess the ability to significantly contribute to the country's sustained economic advancement. It is worth mentioning that the primary sector of Kazakhstan's industrial output consists of crude oil and natural gas, whereas the Kyrgyz Republic primarily emphasizes basic metals and finished metal products. This distinction enables the Kyrgyz Republic to cultivate its unique expertise and focus in areas where it possesses a competitive advantage.

By seizing favorable circumstances and tackling current obstacles in the nation through the promotion of novelty, enhancement of infrastructure, and attraction of investments, Kyrgyzstan can unleash its industrial capacity and make a significant contribution to the general economic expansion and integration in the Eurasian area. It is relevant for further research to assess the potential of other economic sectors of the Kyrgyz Republic, assessing the opportunities for their development considering integration into the EAEU. In addition, it is important to explore in more detail the manufacturing industry in the country, for example, at the enterprise level.

Declaration of competing interest

The authors declare that they have no known financial or non-financial competing interests in any material discussed in this paper.

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Author contribution

The contribution to the paper is as follows: Merimkul Kerimkulova: Writing – Review & Editing, Supervision; Klara Shakirova: Project administration; Baktygul Esenalieva: Methodology, Conceptualization; Svetlana Makeeva: Resources, Writing – Original Draft; Saltanat Omurova: Writing – Original Draft. All authors approved the final version of the manuscript.

Abbreviations and acronyms

Eurasian Economic Integration – EAEI;

Eurasian Economic Union – EAEU;

Gross Domestic Product – GDP;

Union of Soviet Socialist Republics – USSR.

References

[1] N. Haraguchi, C. F. C. Cheng and E. Smeets, “The importance of manufacturing in economic development: Has this changed?” *World Development*, no. 93, p. 293–315, 2017.

[2] A. Baikin, U. Shalbolova and L. Kazbekova, “Regional diversification of entrepreneurial activity in the Republic of Kazakhstan,” *Espacios*, vol. 38, no. 46, p. 35, 2017.

[3] R. K. Pandian, “Does manufacturing matter for economic growth in the era of globalization?” *Social Forces*, vol. 95, no. 3, p. 909–940, 2017.

[4] N. S. Buktukov, B. Z. Buktukov and G. Z. Moldabayeva, “Sail-aerodynamic wind power station with automatically changing blade-swept area,” *International Journal of Mechanical and Production Engineering Research and Development*, vol. 10, no. 3, p. 911–920, 2020.

[5] B. Tyliszczak, A. Drabczyk, S. Kudłacik-Kramarczyk, B. Grabowska and M. Kędzierska, "Physicochemical properties and cytotoxicity of hydrogels based on Beetosan® containing sage and bee pollen," *Acta Biochimica Polonica*, vol. 64, no 4, p. 709–712, 2017.

[6] D. Shokatayeva, L. Ignatova, I. Savitskaya, A. Kistaubaeva, A. Talipova, A. Asylbekova, M. Abdulzhanova and A. Mashzhan, "Bacterial cellulose and pullulan from simple and low cost production media," *Eurasian Chemico-Technological Journal*, vol. 21, no. 3, p. 247–258, 2019.

[7] R. Dinzhos, N. Fialko, V. Prokopov, Yu. Sherenkovskiy, N. Meranova, N. Koseva, V. Korzhik, O. Parkhomenko and N. Zhuravskaya, "Identifying the influence of the polymer matrix type on the structure formation of microcomposites when they are filled with copper particles," *Eastern-European Journal of Enterprise Technologies*, vol. 5, no. 6-107, p. 49–57, 2020.

[8] M. A. Mansurova, S. H. H. Bekhbudov, R. O. Zhilisbaeva, S. S. H. Tashpulatov and M. B. Baymakhanova, "The analysis of vertical fluctuations of the roller with the rubber plug of the device for drawing of the polymeric composition on lines of sewed materials in the sewing-machine," *Izvestiya Vysshikh Uchebnykh Zavedenii, Seriya Teknologiya Tekstil'noi Promyshlennosti*, vol. 377, no. 2018-January(5), p. 142–145, 2018.

[9] N. V. Trusova, S. V. Karman, M. A. Tereshchenko and Y. O. Prus, "Debt burden of the financial system of Ukraine and countries of the Eurozone: Policy of regulating of the risks," *Espacios*, vol. 39, no. 39, 2018. https://www.revistaespacios.com/a18v39n39/a18v39n39p30.pdf

[10] T.-C. Chen, F. J. Ibrahim Alazzawi, D. Mavaluru, T. Mahmudiono, Y. Enina, S. Chupradit, A. Al Ayub Ahmed, M. H. Syed, A. M. Ismael and B. Miethlich, "Application of Data Mining Methods in Grouping Agricultural Product Customers," *Mathematical Problems in Engineering*, vol. 2022, p. 3942374, 2022.

[11] L. Musiy, O. Tsisaryk, I. Slyvka, O. Mykhaylytska and B. Gutyj, "Research into probiotic properties of cultured butter during storing," *Eastern-European Journal of Enterprise Technologies*, vol. 3, no. 11-87, p. 31–36, 2017.

[12] B. Khussain, A. Brodskiy, A. Sass, K. Rakhmetova, V. Yaskevich, V. Grigor'eva, A. Ishmukhamedov, A. Shapovalov, I. Shlygina, S. Tungatarova and A. Khussain, "Synthesis of Vanadium-Containing Catalytically Active Phases for Exhaust Gas Neutralizers of Motor Vehicles and Industrial Enterprises," *Catalysts*, vol. 12, no. 8, p. 842, 2022.

[13] V. Shevko, Y. Afimin, G. Karataeva, A. Badikova and T. Ibrayev, "Theory and technology of manufacturing a ferroalloy from carbon ferrochrome dusts," *Acta Metallurgica Slovaca*, vol. 27, no. 1, p. 23–37, 2021.

[14] A. Begzhan, S. Aidarbayev, M. Hartwig, S. Alibekov and Z. Zhailau, "International legal regulation of government procurement for sustainable development in the framework of the WTO," *Rivista di Studi sulla Sostenibilita*, no. 2, p. 95–109, 2021.

[15] P. Anand, D. Husain and R. Prakash, "Sustainable integrated system for rural development: a case study," *Insights into Regional Development*, vol. 4, no. 3, p. 96–109, 2022. http://doi.org/10.9770/IRD.2022.4.3(6)

[16] R. Frankiv, "The city of the future in the European Commission's documents: A comprehensive analysis," *Architectural Studies*, vol. 9, no. 1, p. 58–64, 2023. https://doi.org/10.56318/as/1.2023.58

[17] R. Kuralbayeva, D. Aitmukhanbetova, G. Itekeyeva, A. Kuatpekova and P. Abdikulova, "Innovative methods of organising the work of the AIC in market conditions (world experience and Kazakhstan)," *Scientific Horizons*, vol. 26, no. 12, p. 158–168, 2023. https://doi.org/10.48077/scihor12.2023.158

[18] Y. S. Oryngozhin, G. Z. Moldabayeva and I. B. Igembaev, "Innovative method of high-viscosity oil production," *12th International Multidisciplinary Scientific GeoConference and EXPO - Modern Management of Mine Producing, Geology and Environmental Protection, SGEM 2012*, vol. 2, p. 463–470, 2012.

[19] G. Moldabayeva and S. Abileva, "Study and determination of regularities in variability of oil rheological properties to enhance oil recovery," *Periodicals of Engineering and Natural Sciences*, vol. 9, no. 4, p. 44–60, 2021.

[20] S. Kerimkhulle, N. Baizakov, A. Slanbekova, Z. Alimova, G. Azieva and M. Koishybayeva, "The Kazakhstan Republic Economy Three Sectoral Model Inter-sectoral Linkages Resource Assessment," *Lecture Notes in Networks and Systems*, vol. 502 LNNS, p. 542–550, 2022.

[21] K. Syrmanova, A. Agabekova, S. Sakibayeva, A. Kovaleva, Y. Botashev, Z. Kaldybekova and S. Bayzhanova, "Physical-mechanical properties research of paint materials on the basis of petroleum bitumen," *Egyptian Journal of Chemistry*, vol. 63, p. 609–616, 2020.

[22] K. K. Syrmanova, A. B. Agabekova, Z. B. Kaldybekova, A. Y. Kovaleva and Y. T. Botashev, "Painting materials production on the basis of petroleum bitumen," *Rasayan Journal of Chemistry*, vol. 13, no. 4, p. 2099–2105, 2020.

[23] B. S. Jamankulov, "Structural changes in the Kyrgyz economy," *Journal of International Economic Affairs*, vol. 9, no. 2, p. 819–832, 2019.

[24] V. P. Babak and V. V. Shchepetov, "Wear Resistance of Amorphous-Crystalline Coatings with Lubricants," *Journal of Friction and Wear*, vol. 39, no. 1, p. 38–43, 2018.

[25] N. Pasichnik, O. Opryshko, S. Shvorov, A. Dudnyk and V. Teplyuk, "Remote field monitoring results feasibility assessment for energy crops yield management," *Machinery & Energetics*, vol. 14, no. 2, p. 46–59, 2023. https://doi.org/10.31548/machinery/2.2023.46

[26] J. Sun, A. Bieliatynskyi, K. Krayushkina and O. Akmaldinova, "Research of properties on graphite conductive slag in asphalt concrete," *E3S Web of Conferences*, vol. 175, p. 11015, 2020.

[27] V. Antonenko, L. Katranzhy, K. Moiseienko, S. Yudina, O. Brezhnyeva-Yermolenko, S. Hanziuk, A. Galnaityte and V. Namiotko, "The prospects for reforming the state fiscal policy," *Contemporary Economics*, vol. 13, no. 4, p. 388–406, 2019.

[28] U. Z. Shalbolova, S. M. Yegemberdiyeva, S. S. Uderbayev, M. A. Elpanova and L. A. Kazbekova, "Specifics of oil pipeline systems' risks management," *Life Science Journal*, vol. 11, no. 11, p. 591–594, 2014.

[29] U. Z. Shalbolova, R. A. Narmanova, E. B. Tlessova and Z. Ryskulova, "Economic efficiency of cold oil bituminous mastic production," *Espacios*, vol. 38, no. 46, p. 36, 2017.

[30] A. Zheirenova, N. Ismailova, D. Isaeva and A. Sulaimanova, "The impact of factors on GDP in Kyrgyzstan," *E3S Web of Conferences*, vol. 380, 01023, 2023.

[31] P. C. Dower, T. P. Gerber and S. Weber, "Firms, kinship networks, and economic growth in the Kyrgyz Republic," *Journal of Comparative Economics*, vol. 50, no. 4, p. 997–1018, 2022.

[32] I. Derid, "Problems of poverty and political instability of Kyrgyzstan," *The Journal of V.N. Karazin Kharkiv National University. Series: International Relations. Economics. Country Studies. Tourism*, vol. 12, p. 18–30, 2020.

[33] C. Guirkinger, G. Aldashev, A. Aldashev and M. Fodor, "Economic persistence despite adverse policies: Evidence from Kyrgyzstan," *The Economic Journal*, vol. 132, no. 641, p. 258–272, 2022.

[34] The World Bank. GDP (Current US$) – Kyrgyz Republic, Kazakhstan, 2023. https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=KG-KZ

[35] Y. V. Chovnyuk, L. A. Diachenko, Y. O. Ivanov, N. P. Dichek and O. V. Orel, "Optimisation of dynamic loads of rope systems of lifting mechanisms of bridge cranes during cargo handling," *Scientific Herald of Uzhhorod University. Series "Physics"*, vol. 51, p. 59–73, 2022. https://doi.org/10.54919/2415-8038.2022.51.59-73

[36] S. Kerimkhulle, Z. Kerimkulov, D. Bakhtiyarov, N. Turtayeva and J. Kim, "In-Field Crop-Weed Classification Using Remote Sensing and Neural Network," *SIST 2021 - 2021 IEEE International Conference on Smart Information Systems and Technologies*, p. 9465970, 2021. https://doi.org/10.1109/SIST50301.2021.9465970.

[37] S. B. Makeyeva, "Problems of economic relations between the countries of the EAEU (Kyrgyz Republic and Republic of Kazakhstan)," *Actual Issues of the Modern Economics*, vol. 5, p. 525–534, 2020.

[38] A. Zaporozhets, V. Babak, A. Sverdlova, V. Isaienko and K. Babikova, "Development of a system for diagnosing heat power equipment based on IEEE 802.11s," *Studies in Systems, Decision and Control*, vol. 346, p. 141–151, 2021.

[39] V. Levchenko, O. Pogosov and V. Kravchenko, "Cobalt application in repair tools for maintenance and modernisation of NPP equipment," *Scientific Herald of Uzhhorod University. Series "Physics"*, vol. 53, p. 31–41, 2023. https://doi.org/10.54919/physics/53.2023.31

[40] O. Ilderbayev, G. Zharmakhanova, S. Rakhyzhanova, A. Musaynova, G. Ilderbayeva, A. Nursafina and L. Zhazykbayeva, "Immune System Response after Immobilization Stress in the Background of Ionizing Radiation," *Trends in Sciences*, vol. 19, no. 13, p. 4637, 2022.

[41] M. Umitzhanov, A. K. Musaeva, A. A. Abishov, T. M. Zhamansarin, U. Zh. Omarbekova, S. Z. Turyspayeva and S. T. Siyabekov, "Approaches to reducing the toxic exposure hazard on the sheep population," *Cell and Tissue Banking*, vol. 23, no. 4, p. 753–765, 2022.

[42] N. K. Komilova, N. N. Ermatova, T. Rakhimova, L. K. Karshibaeva and M. O. Hamroyev, "Urboekological situation and regional analysis of population health in Uzbekistan," *International Journal of Agricultural Extension*, vol. 9, no. Special Issue, 65–69, 2021.

[43] O. Topchii, Y. Kotliar, V. Pasichnjy, I. Shevchenko, A. Tymchuk, Y. Kryzhova, A. Petryna and D. Nadiia, "Antioxidant effect of fat-soluble rosemary and green tea extracts on storage period prolongation of meat paste," *Journal of Hygienic Engineering and Design*, vol. 33, p. 1–11, 2021.

[44] N. A. Dolzhenko, E. N. Mailyanova, I. Z. Assilbekova and Z. E. Konakbay, "Design features of modern flight simulation devices, mobility systems and visualization systems," *News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences*, vol. 3, no. 447, p. 17–21, 2021.

[45] N. Dolzhenko, "The development of a mathematical model of professional training of aviation personnel participated in ensuring flight safety," *Eastern-European Journal of Enterprise Technologies*, vol. 4, no. 4(124), p. 88–94, 2023.

[46] W. Naudé and A. Szirmai, "The importance of manufacturing in economic development: Past, present and future perspectives," *MERIT Working Papers*, vol. 2012-041, 2012. https://ideas.repec.org/p/unm/unumer/2012041.html

[47] N. Tovma, B. Torgaeva and A. Mamyrbayev, "Methodology for statistical research of social partnership in the Republic of Kazakstan," *Actual Problems of Economics*, vol. 145, no. 7, p. 493–497, 2013.

[48] E. Attiah, "The role of manufacturing and service sectors in economic growth: An empirical study of developing countries," *European Research Studies Journal*, vol. 22, no. 1, p. 112–127, 2019.

[49] A. Groza and N. Siddelev, "Nonlinear surface polaritons near the interface between a magneto-optical substance and a nonlinear metamaterial with a permittivity close to zero," *Scientific Herald of Uzhhorod University. Series "Physics"*, vol. 51, p. 24–29, 2022. https://doi.org/10.54919/2415-8038.2022.51.24-29

[50] L. F. Sukhodub, L. B. Sukhodub, A. D. Pogrebnjak, A. Turlybekuly, A. Kistaubayeva, I. Savitskaya and D. Shokatayeva, "Effect of magnetic particles adding into nanostructured hydroxyapatite–alginate composites for orthopedics," *Journal of the Korean Ceramic Society*, vol. 57, no. 5, p. 557–569, 2020.

[51] Y. D. Zhukov, B. N. Gordeev and A. V. Zivenko, "Polymetric sensing of intelligent robots," *Proceedings of the 2013 IEEE 7th International Conference on Intelligent Data Acquisition and Advanced Computing Systems, IDAACS 2013*, vol. 2, p. 880–884, 2013.

[52] S. S. Tashpulatov, A. D. Dzhuraev, I. K. Chervnova, B. R. Ryskulova, G. A. Ganieva, S. K. Bekhbudov and K. Raydosova, "Theoretical-experimental method of determination of parameters of the roller with the rubber bushing of the device for applying the polymer composition on the connecting seams of

clothing items," *Izvestiya Vysshikh Uchebnykh Zavedenii, Seriya Teknologiya Tekstil'noi Promyshlennosti*, vol. 378, no. 2018-January(6), p. 141–145, 2018.

[53] M. Yu. Kharlamov, I. V. Krivtsun and V. N. Korzhyk, "Dynamic model of the wire dispersion process in plasma-Arc spraying," *Journal of Thermal Spray Technology*, vol., 23, no. 3, p. 420–430, 2014.

[54] S. B. Makeyeva, "Strategy for the development of the industrial sector as part of the implementation of the economic growth of the Kyrgyz Republic," *Eurasian Scientific Association*, vol. 3-3, no. 61, p. 191–194, 2020.

[55] B. Tyliszczak, A. Drabczyk and S. Kudłacik, "Comparison of hydrogels based on commercial chitosan and beetosan® containing nanosilver," *Molecules*, vol. 22, no. 1, p. 61, 2017.

[56] B. Tyliszczak, A. Drabczyk, S. Kudłacik-Kramarczyk, K. Rudnicka, J. Gatkowska, A. Sobczak-Kupiec and J. Jampilek, "In vitro biosafety of pro-ecological chitosan-based hydrogels modified with natural substances," *Journal of Biomedical Materials Research - Part A*, vol. 107, no. 11, p. 2501–2511, 2019.

[57] M. Pētersone, K. Ketners, D. Krieviņš, I. Erins, O. G. Rakauskiene and I. Eriņa, "Network for Disease-Specific Networking Strategy to Increasing of Public Value: Latvia's Approach," *Lecture Notes in Networks and Systems*, vol. 267, p. 363–370, 2021.

[58] G. Sunkad, "The role of industries in the development of the nation," *European Journal of Research Development and Sustainability (EJRDS)*, vol. 2, no. 4, p. 55–58, 2021.

[59] M. Abdibattayeva, K. Bissenov, Z. Zhubandykova, R. Orynbassar and L. Tastanova, "Complex Oil-containing Waste Treatment by Applying Solar Energy," *Environmental and Climate Technologies*, vol. 24, no. 1, p. 718–739, 2020.

[60] N. M. Fialko, V. G. Prokopov, N. O. Meranova, Yu. S. Borisov, V. N. Korzhik and G. P. Sherenkovskaya, "Heat transport processes in coating-substrate systems under gas-thermal deposition," *Fizika i Khimiya Obrabotki Materialov*, vol. 2, p. 68–75, 1994.

[61] V. Matsiuk, V. Opalko, L. Savchenko, O. Zagurskiy and N. Matsiuk, "Optimisation of transport and technological system parameters of an agricultural enterprise in conditions of partial uncertainty," *Machinery & Energetics*, vol. 14, no. 3, p. 61–71, 2023. https://doi.org/10.31548/machinery/3.2023.61

[62] E. Shahini, R. Myalkovsky, K. Nebaba, O. Ivanyshyn and D. Liubytska, "Economic and biological characteristics and productivity analysis of sunflower hybrids," *Scientific Horizons*, vol. 26, no. 8, p. 83–95, 2023.

[63] U. Chomanov, G. Zhumaliyeva, T. Tultabayeva, L. Mamaeva, A. Shoman and R. Kasimbek, "The influence of bioadditive complex on the rheological properties of macaroni dough," *Journal of Engineering and Applied Sciences*, vol. 12, no. 12, p. 3225–3232, 2017.

[64] V. Honchar, O. Iakubchak, L. Shevchenko, S. Midyk, V. Korniyenko, V. Kondratiuk, T. Rozbytska, V. Melnik and Y. Kryzhova, "The effect of astaxanthin and lycopene on the content of fatty acids in the yolks of chicken eggs under different storage regimes," *Potravinarstvo Slovak Journal of Food Sciences*, vol. 16, p. 473–489, 2022.

[65] H. K. Karimov, E. Mustafayeva, E. Jafarov, T. Safarova and F. Veliev, "Theoretical Study of the Grate-Sawtype Large-Litter Cleaner of the Mounted Type," *Eastern-European Journal of Enterprise Technologies*, vol. 2, p. 74–84, 2021.

[66] S. B. Kataeva, L. F. Nemirova, S. S. H. Tashpulatov, U. T. Muminova and R. O. Zhilisbaeva, "Research of knitted fabrics for daily use thermal fabric," *Izvestiya Vysshikh Uchebnykh Zavedenii, Seriya Teknologiya Tekstil'noi Promyshlennosti*, vol. 383, no. 5, p. 154–158, 2019.

[67] O. Mytrofanov, A. Proskurin, A. Poznanskyi and O. Zivenko, "Determining the effect of anti-friction additive on the power of mechanical losses in a rotary piston engine," *Eastern-European Journal of Enterprise Technologies*, vol. 4, no. 1(124), p. 28–34, 2023.

[68] N. Fialko, R. Dinzhos, J. Sherenkovskii, N. Meranova, V. Prokopov, V. Babak, V. Korzhyk, D. Izvorska, M. Lazarenko and V. Makhrovskyi, "Influence on the thermophysical properties of nanocomposites of

the duration of mixing of components in the polymer melt," *Eastern-European Journal of Enterprise Technologies*, vol. 2, no. 5-116, p. 25–30, 2022.

[69] D. Su and Y. Yao, *Manufacturing as the key engine of economic growth for middle income economies*, 2016. https://www.adb.org/sites/default/files/publication/184350/adbi-wp573.pdf

[70] Y. Tsapko, V. Lomaha, A. Tsapko, S. Mazurchuk, O. Horbachova and D. Zavialov, "Determination of regularities of heat resistance under flame action on wood wall with fire-retardant varnish," *Eastern-European Journal of Enterprise Technologies*, vol. 4, no. 10, p. 55–60, 2020.

[71] V. Vlasovets, T. Vlasenko, S. Kovalyshyn, O. Kovalyshyn, O. Kovalyshyn, S. Kurpaska, P. Kiełbasa, O. Bilovod and L. Shulga, "Effect of various factors on the measurement error of structural components of machine parts materials microhardness using computer vision methods," *Przeglad Elektrotechniczny*, vol. 99, no. 1, p. 323–329, 2023.

[72] A. E. Yerzhanova, S. Y. Kerimkhulle, G. B. Abdikerimova, M. Makhanov, S. T. Beglerova and Z. K. Taszhurekova, "Atmospheric correction of landsat-8 / Oli data using the flaash algorithm: Obtaining information about agricultural crops," *Journal of Theoretical and Applied Information Technology*, vol. 99, no. 13, p. 3110–3119, 2021.

[73] E. Shahini, O. Shebanina, I. Kormyshkin, A. Drobitko and N. Chernyavskaya, "Environmental consequences for the world of Russia's war against Ukraine," *International Journal of Environmental Studies*, 2024. https://doi.org/10.1080/00207233.2024.2302745

[74] A. Andreoni and M. Gregory, "Why and how does manufacturing still matter: Old rationales, new realities," *Revue D'économie Industrielle*, vol. 144, no. 4, p. 21–57, 2013.

[75] V. Korzhyk, V. Khaskin, O. Voitenko, V. Sydorets and O. Dolianovskaia, "Welding technology in additive manufacturing processes of 3D objects," *Materials Science Forum*, vol. 906, p. 121–130, 2017.

[76] V. G. Nenajdenko, N. G. Shikhaliyev, A. M. Maharramov, G. T. Atakishiyeva, A. A. Niyazova, N. A. Mammadova, A. S. Novikov, I. V. Buslov, V. N. Khrustalev and A. G. Tskhovrebov, "Structural Organization of Dibromodiazadienes in the Crystal and Identification of Br···O Halogen Bonding Involving the Nitro Group," *Molecules*, vol. 27, no. 16, p. 5110, 2022.

[77] K. Bolatbek, S. I. Ivanov, M. G. Gordienko and N. V. Menshutina, "Mathematical modeling of aerogel structures, including with embedded carbon nanotubes," *International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management*, SGEM, 3(BOOK 6), p. 69–76, 2016.

[78] T. Obradovic, B. Vlačić and M. Dabić, "Open innovation in the manufacturing industry: A review and research agenda," *Technovation*, vol. 102, p. 102221, 2021.

[79] W. Li, D. Xue and X. Huang, "The role of manufacturing in sustainable economic development: A case of Guangzhou, China," *Sustainability*, vol. 10, no. 9, p. 3039, 2018.

[80] I. V. Cherunova, E. B. Stefanova and S. Sh. Tashpulatov, "Development of an algorithm for forming the structure of composite fiber insulation with heat-accumulating properties in clothing," *IOP Conference Series: Materials Science and Engineering*, vol. 1029, no. 1, p. 012041, 2021.

[81] Sh. A. Zeynalov, F. Sh. Kerimov, S. I. Safarova, B. G. Garajaev and G. S. Jafarova, "Effect of phenol-formaldehyde resin on mechanical durability and structure of low-density polyethylene," *Scientific Herald of Uzhhorod University. Series "Physics"*, vol. 54, p. 96–104, 2023. https://doi.org/10.54919/physics/54.2023.96

[82] V. Agadjanian and E. Gorina, "Economic swings, political instability and migration in Kyrgyzstan," *European Journal of Population*, vol. 35, no. 2, p. 285–304, 2019.

[83] G. Tokysheva, K. Makangali, Y. Uzakov, M. Kakimov, N. Vostrikova, M. Baiysbayeva and N. Mashanova, "The potential of goat meat as a nutrition source for schoolchildren," *Potravinarstvo Slovak Journal of Food Sciences*, vol. 16, p. 398–410, 2022.

[84] G. Mostafa and M. Mahmood, "Eurasian Economic Union: Evolution, challenges and possible future directions," *Journal of Eurasian Studies*, vol. 9, no. 2, p. 163–172, 2018.

[85] K. Syrmanova, A. Agabekova, S. Sakibayeva, A. Kovaleva, Y. Botashev, Z. Kaldybekova and S. Bayzhanova, "Physical-mechanical properties research of paint materials on the basis of petroleum bitumen," *Egyptian Journal of Chemistry*, vol. 63, p. 609–616, 2020.

[86] A. Tanchak, K. Katovsky, I. Haysak, J. Adam and R. Holomb, "Research of spallation reaction on plutonium target irradiated by protons with energy of 660 MeV," *Scientific Herald of Uzhhorod University. Series "Physics"*, vol. 52, p. 36–45, 2022. https://doi.org/10.54919/2415-8038.2022.52.36-45

[87] Z. Wei and X. Yunfei, "Research on high-quality development of manufacturing enterprises," *E3S Web of Conferences*, vol. 235, p. 01005, 2021.

[88] V. Babak, O. Dekusha, S. Kovtun and S. Ivanov, "Information-measuring system for monitoring thermal resistance," *CEUR Workshop Proceedings*, vol. 2387, p. 102–110, 2019.

[89] M. Ardolino, A. Bacchetti and D. Ivanov, "Analysis of the COVID-19 pandemic's impacts on manufacturing: A systematic literature review and future research agenda," *Operations Management Research*, vol. 15, p. 551–566, 2022.

[90] M. Muhammedov, A. Nizamov, G. Mustafoev, B. Babakulov and Sh. Yuldashev, "The role of agriculture in shaping the prospects of socio-economic development of Uzbekistan," *Scientific Horizons*, vol. 26, no. 11, p. 155–165, 2023. https://doi.org/10.48077/scihor11.2023.155

[91] H. N. Mursalova, L. K. Baimagambetova and O. Ozpence, "Assessment of the Eurasian Economic Union countries integration economic efficiency," *Central Asian Economic Review*, vol. 3, p. 6–19, 2021.

[92] V. M. Shevko, Y. Y. Akylbekov, G. Y. Karataeva and A. D. Badikova, "Recycling of chrysotile-Asbestos production waste," *Metallurgical Research and Technology*, vol. 119, no. 4, p. 410, 2022.

[93] K. K. Syrmanova, N. E. Botabaev, J. B. Kaldybekova, S. B. Bayzhanova and A. M. Tuleuov, "The study of adsorptive capacity of kulantau vermiculite," *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, vol. 7, no. 1, p. 1282–1293, 2016.

[94] F. Yang, Y. Sun, Y. Zhang and T. Wang, "Factors affecting the manufacturing industry transformation and upgrading: A case study of Guangdong-Hong Kong-Macao greater bay area," *International Journal of Environmental Research and Public Health*, vol. 18, no. 13, p. 7157, 2021.

[95] K. B. Biyashev, Z. S. Kirkimbaeva, B. K. Biyashev, A. Z. Makbuz and M. D. Bulegenova, "Determination of the level of resistance of probiotic strain escherichia coli 64g to hydrochloric acid, bile and antimicrobial agents," *Ecology, Environment and Conservation*, vol. 25, no. 4, p. 1930–1933, 2019.

[96] K. B. Biyashev, B. K. Biyashev and A. Z. Makbuz, "Prevalence of causative agents of emergent food zoonotic diseases in animals, animal origin products and environmental objects," *Biology and Medicine*, vol. 8, no. 2, p. BM-169-16, 2016.

[97] N. V. Trusova, O. V. Hryvkivska, N. S. Tanklevska, L. A. Vdovenko, O. S. Prystemskyi and S. V. Skrypnyk, "Regional aspect of formation: The potential of financial safety in Agrarian enterprises of Ukraine," *Asia Life Sciences*, vol. 1, p. 169–186, 2019.

[98] M. Kumar and M. Mani, "Sustainability assessment in manufacturing for effectiveness: Challenges and opportunities," *Frontiers in Sustainability*, vol. 3, p. 837016, 2022.

[99] N. V. Trusova, R. I. Oleksenko, S. V. Kalchenko, D. V. Yeremenko, S. R. Pasieka and S. A. Moroz, "Managing the intellectual potential in the business-network of innovative digital technologies," *Estudios de Economia Aplicada*, vol. 39, no. 5, p. 1–15, 2021.