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Consequences of the integration to the Eurasian Economic Union: methodology of statistical evaluation and first results

Abstract. The study represents an assessment of socio-economic integration consequences within the framework of the Eurasian Economic Union (EEU) for the participating countries - Armenia, Belarus, Kazakhstan, Kyrgyzstan and Russia. The authors implemented a personally developed approach of integral efficiency evaluation based on the calculation of the coefficients of state social and economic development indicators of growth as a main method for such assessment. These indicators allow us to characterise the following segments: national welfare, inflation, investment activity, labour market and the level of poverty, and the condition of the main economic sectors. The authors determined that Russia is the only export-oriented member of the Eurasian Economic Union (EEU). The worst consequences of integration in the cross-border trade sphere are observed in Belarus. For the analysed countries (excluding Kyrgyzstan), the first year of the existence of the EEU can be characterised as a period of economic recession (2015). According to the comparison of integral rates for the periods of 2005-2014 and 2015-2017, it was defined that the integration had a positive economic effect in the short term. By now, all the five participating countries have achieved the same level of social and economic development as in the pre-crisis period (2012-2013). In terms of the EEU membership, the calculated economic growth expands from 3% in Kyrgyzstan (by the integral index) up to 30% in the Republic of Belarus. Russia has also significantly strengthened its position (the growth rate of the index in 2015-17 was 25%).
Keywords: EEU; Integral Rate; Socio-economic Development; Economic Indicators; International Integration
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Наслідки інтеграції в ЄАЕС: методика статистичної оцінки та перші результати

Анотація. Дослідження присвячено оцінці соціально-економічних наслідків інтеграції в рамках ЄАЕС для країн-учасниць: Вірменії, Білорусі, Казахстану, Киргизстану та Росії. Методикою дослідження передбачено використання авторського підходу до інтегральної оцінки ефективності, заснованого на розрахунку коефіцієнтів росту індикаторів соціально-економічного розвитку держави. Зазначені індикатори дозволяють охарактеризувати такі макроекономічні категорії, як національний добробут, інфляція, інвестиційна активність, ринок праці, рівень бідності, а також стан основних галузей. Авторами статті було визначного, що Російська Федерація є єдиним експортно-орієнтованим членом ЄАЕС. Найгірші наслідки інтеграції спостерігаються в Республіці Білорусь. Перший рік існування ЄАЕС характеризується для аналізованих країн (за винятком Киргизстану) як період економічного спаду. У результаті зіставлення інтегральних оцінок за періоди 2005–2014 рр. та 2015–2017 рр. було визначено, що в короткостроковому періоді інтеграція в ЄАЕС мала

позитивний вплив. На даний момент усім 5 країнам-учасницям вдалося досягти рівня соціально-економічного розвитку, наявного в докризові 2012–2013 роки. За час членства в ЄАЕС економічне зростання визначено від 3% у Киргизстані (за інтегральним індексом) до 30% у Республіці Білорусь. Російська Федерація також істотно зміцнила своє становище (темп зростання індексу в 2015–2017 роках склав 25%).
Ключові слова: ЄАЕС; інтегральна оцінка; соціально-економічний розвиток; індикатори економіки; міжнародна інтеграція.

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Последствия интеграции в ЕАЭС: методика статистической оценки и первые результаты

Аннотация. Исследование посвящено оценке социально-экономических последствий интеграции в рамках ЕАЭС для стран-участниц: Армении, Беларуси, Казахстана, Кыргызстана и России. В качестве методики исследования использован авторский подход к интегральной оценке эффективности, основанный на расчете коэффициентов роста индикаторов социально-экономического развития государства. Указанные индикаторы позволяют охарактеризовать следующие макроэкономические категории: национальное благосостояние, инфляцию, инвестиционную активность, рынок труда, уровень бедности, а также состояние основных отраслей экономики. Авторами статьи определено, что Российская Федерация является единственным экспортно-ориентированным членом ЕАЭС. Самые худшие последствия от интеграции отмечены в Республике Беларусь. Первый год существования ЕАЭС характеризуется для анализируемых стран (за исключением Кыргызстана) как период экономического спада (2015 год). В результате сопоставления интегральных оценок за периоды 2005–2014 гг. и 2015–2017 гг. определено, что в краткосрочном периоде интеграция в ЕАЭС принесла положительный экономический эффект. На данный момент всем 5 странам–участницам удалось достичь уровня социально-экономического развития, отмеченного в докризисные 2012–2013 гг. Экономический рост за время членства в ЕАЭС определен от 3% в Киргизии (по интегральному индексу), до 30% в Республике Беларусь. Российская Федерация также существенно упрочила свое положение (темп роста индекса в 2015–2017 гг. составил 25%).
Ключевые слова: ЕАЭС; интегральная оценка; социально-экономическое развитие; индикаторы экономики, международная интеграция.

1. Introduction

Integration unions have a significant impact on the national economies of their members. However, the results from membership in international inions are not always positive (Stiglitz, 2010) [1]. Given the relatively low competitiveness of national economic and financial systems, openness leads to the vulnerability of some sectors of the economy (Colacito and Mariano, 2010) [2].

The establishment of the Eurasian Economic Union has become a logical result of the strengthening of international relations of the Customs Union. On the one hand, the fruitful cooperation of the EEU member countries, both on the political and economic arena, for quite a long time (more than 25 years) allows predicting high potential results of such integration [3]. On the other hand, existing barriers, primarily of economic nature, can affect national competitiveness adversely [4]. For instance, it is important to note the fact that the economic basis of the EEA member countries has significant impact on the main factor of the competitiveness of domestic products - pricing (the Russian platform is based on private business, while the Belarusian one is based on public administration).

Moreover, there is a need to expand the EEU internal market, primarily due to the growing number of union participants [5]. However, this provision is very controversial, for example, regarding the inclusion of Kyrgyzstan with its very low population solvency, and a large number of economic problems at the state level. In this regard, the assessment of the consequences of integration at the first stage of the formation of the EEU is very relevant. In addition, an analysis of economic results in the EEU member countries is required not only in the period of its operating (2015-2017), but also in the previous years. The period of 2005-2014 was used to determine the trend. This defines the purpose of the scientific research, which is to assess the socio-economic impact of the establishment of the EEU on the participating countries.

2. Brief Literature Review

Scientists from around the world asses the consequences of economic integration from different sides [6]. From the standpoint of this study, the methodology of such assessment is of the greatest interest, since it is almost impossible to analyse the efficiency of integration with a high level of probability within the framework of the existence of the EEU of one year. The Eurasian Economic Union itself was created only in 2015.

The study dedicated to the consequences of China integration and to technological changes in the multi-country Ricardian-Heckscher-Olin quantitative model, conducted by American scientists (Julian di Giovanni, Andrei A. Levchenko, Jing Zhang, 2014) attracts a great interest [7]. The authors used a scenario approach that consists of two alternative growth option evaluations: «balanced», in which China's productivity grows at the same speed in each sector of the economy, and «unbalanced», in which the comparatively undeveloped sectors of the Chinese economy develop much faster than the average productivity by countries of the world. A completely different approach based on the use of nonparametric criteria was used to assess the integration of China into the world in a similar study (Adao, Costinot, Donaldson, 2017) [8]. P. Fabrizio and V. Kvadrini (Fabrizi, Quadrini, 2018) analysed the impact of international integration on financial crises of the participating countries using imitation mathematical modeling [9]. The results obtained by the authors show that international unions are the least susceptible to financial crises, but if such a crisis occurs, all members of the union suffer from the negative impact.

Some studies are devoted to the assessment of economic integration, take into account the political influence. A. Sapir (2011) shows, by the example of the European Union, the impact of the policy on the euro-dollar exchange rate, and, as a consequence, the economic situation within the integration union [10].

T. P. Aldohina uses an integrated approach to assess the effectiveness of integration processes (on the example of the EEU). In the study, she offers a system of statistical indicators that allow making a comprehensive assessment of the socio-economic consequences for the EEU member countries [11].

The article of M. Zos-Kior, I. Kuksa, Iu. Samoilyk, M. Storoška is dedicated to the study of the integral evaluation of the globalisation consequences [12]. As a basic category of evaluation, the authors use the integral development index created by the Swiss Economic Institute. The main difference between the proposed integral index and the authors' methodology is that rank coefficients are used to calculate the main macroeconomic indicators. However, this approach does not allow us to assess minor economic trends due to low ranks sensitivity. Moreover, the rank-based approach is focused on spatial assessment (by countries), while the coefficient approach allows to study changes in dynamics separately for each EEU member. This fact determines the scientific novelty of this study.

3. Research Methodology

As the basic study methodology, the statistical methods for dynamic series analysis of the EEU members' cross-border trade indicators were used. To assess the impact of integration processes in the Eurasian economic space, the authors applied an integrated approach based on the calculation of the aggregate indicator of economic growth. Seventeen indicators characterising the EEU countries were selected as indicators of economic growth. These indicators reflect the following segments (Figure 1):

1. National welfare, represented in the form of the gross domestic product of each EEU member.
2. Inflation. The approach of inflation estimation through the consumer price index.
3. Investment activity. This aspect is evaluated through the volume of investment in the fixed capital and, among other things, it characterises the investment attractiveness of national economies for foreign partners (including the EEU members).
4. Labour market and poverty level. This segment allows to assess the impact of EEU membership on the aggregate level of wages (as on one of the elements of state competitiveness), as well as the degree of social inequality and population stratification by income level.
5. Condition of the main economy branches. The sphere of material production (agriculture and industry), as well as construction (this branch is an indicator of the financial condition of any county and this area is most sensitive to crisis) and transport are chosen as priority sectors [13-15]. Transport has a significant impact on internal and external logistics. Therefore, it increases business attractiveness [16-18], both in terms of the availability of manufactured goods for consumers and the increase of the turnover rate for producers.

The identity of the methodologies used to calculate corresponding indicators is an obligatory statistical condition in order to conduct an intercountry analysis. In this regard, data relating to the seventeen indicators studied for the period of 2005-2016 was taken from the official EEC (Eurasian Economic Commission) website in a comparable form. The only exception was made for the average monthly nominal wage in the Republic of Armenia. Starting from 2013, the National Statistical Committee of Armenia included mandatory social insurance payments, as well as military salaries in the indicator. In this connection, closing of the dynamic series of this indicator through the conversion factor determined by the data of 2012 (1) was calculated:

$$K = \frac{q_{2012-0}}{q_{2012-1}}, \quad (1)$$

where:

K - the coefficient of dynamic series closure;

$q_{2012\text{-}1}$ - the average nominal wage in 2012 according to the calculation methodology of 2013;

$q_{2012\text{-}0}$ - the average nominal wage in 2012 according to the calculation methodology of 2012.

The indicators of 2017 are taken from the official websites of the national statistical committees of the EEU countries with the verification of their calculation methodology according to the EEC data.

The next step in determining the integral index of economic development is the calculation of the growth coefficients for the relevant indicators. Since comparison of different quality characteristics is impossible, there occurs an objective need for their transformation into a comparable form. The authors used the coefficient approach, in connection with the fact that it allows not only to bring the data in a comparable form but also to determine the main economic trends (growth or decline). In the context of the implementation of this methodology, it is necessary to take into account that the selected economic indicators have a multidirectional effect (some act as indicators of growth, others act as a recession). Thus, for growth indicators, the coefficients should be calculated as a ratio of the indicator values in the reporting year to the base one, calculations for the indicators of decline should be inverse.

Among the selected indicators, only four reveal the destructive nature of the changes. They are the poverty level, %; the coefficient of funds; the Gini index and the consumer price index, in % to December of the previous year.

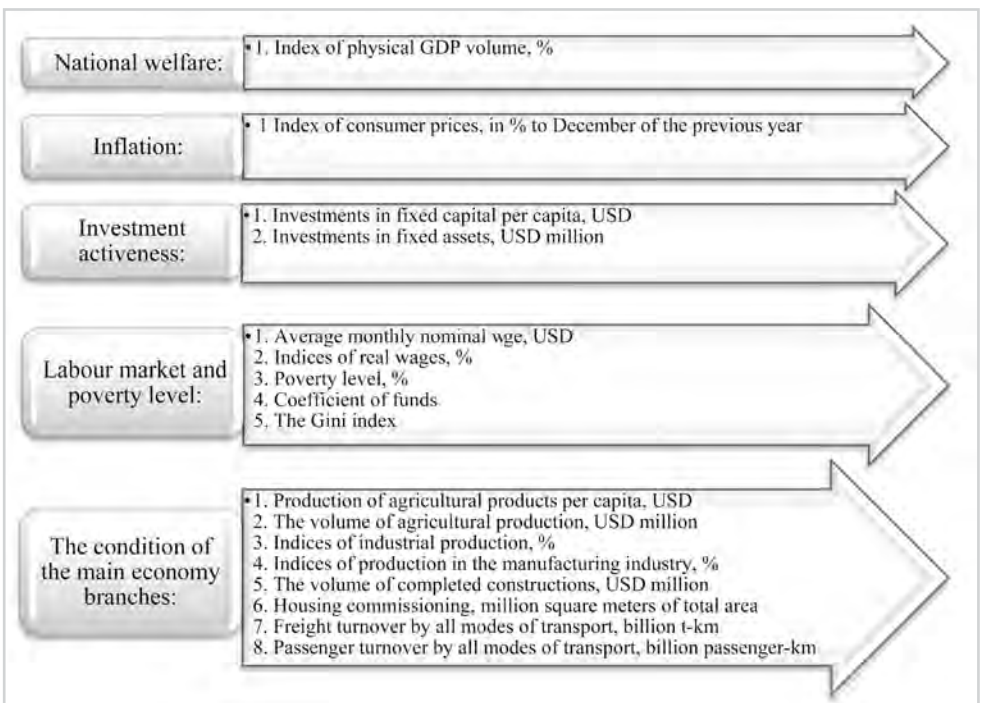

Fig. 1: **System of state social and economic development indicators**
Source: Compiled by the authors

As a result, the final stage of the analysis is the calculation of the socio-economic development integral indicator as the arithmetic mean of seventeen individual coefficients (2):

$$I = \frac{\sum_{i=1}^{i=17} k_i}{n}, \quad (2)$$

where:
k_i - the individual growth factor for the i-th indicator;
n - the number of selected indicators (17 in the authors' study).

4. Results

To assess the direction of the foreign trade policy of the EEU countries (either exports or imports), we determined the trade balance for each participating country (Table 1).

The analysis showed that only the Russian Federation among the EEU countries is an export-oriented member (exports exceed imports consistently in 2015-2017). The Russian trade balance grew by 11% in 2017, as compared to 2016. At the same time, the trend of the cross-border trade with those states that are not EEU member countries is not determined in Russia. On the one hand, the trade balance remains positive despite the difficult economic and political situation. On the other hand, it has declined by 22% over the three-year period. The reduction in the balance of foreign trade is not secured by the same reduction in domestic trade.

Armenia and Kyrgyzstan are importing countries both in foreign and domestic trade during the analysed period. Belarus sharply lost its positions, especially in 2016, when the trade balance of the country became negative. At the same time, Kazakhstan managed to consolidate its positions. The trade balance in the country increased by 22% for 3 years, and the same indicator for the 1st quarter of 2018 also confirms the tendency towards growth. It is worth noting that these indicators of cross-border trade balance of the EEU countries were achieved even during growth of aggregate turnover (Table 2).

To assess the impact of integration in the Eurasian Economic Area, we analysed the integral indicator of the socio-economic development of participating countries. The indicators (by EEU members) of the development of the main manufacturing industries for the period between 2005 to 2017 are represented in Table 3. The growth coefficients calculated on the basis of the indicators are shown in Table 4.

Tab. 1: **External and mutual trade balance of the EEU countries (export-import), USD million**

	2015	2016	2017	January-March 2018	2017 to 2015, %
External trade (excluding the EEU)					
Armenia	-991	-766	-1,188	-316	120
Belarus	2,565	-80	1,098	973	43
Kazakhstan	21,479	17,294	26,161	8062	122
Kyrgyzstan	-1016	-1249	-1408	-574	139
Russia	146,270	91,957	114,714	44,107	78
Internal trade (within the EEU)					
Armenia	-733	-669	-752	-206	103
Belarus	-6,200	-3,996	-6,125	-2,035	99
Kazakhstan	-6,091	-5,933	-7,123	-1,530	117
Kyrgyzstan	-1,655	-1,179	-1,282	-243	77
Russia	14,640	12,310	16,220	4,535	111

Source: Calculated by the authors based on [19]

Tab. 2: **Growth rates of exports and imports volume by EEU member countries**

Export total	2017 to 2015	2017 to 2016	Import total	2017 to 2015	2017 to 2016
Armenia	1.4	1.2	Armenia	1.3	1.3
Belarus	1.0	1.3	Belarus	1.1	1.2
Kazakhstan	1.1	1.3	Kazakhstan	0.9	1.1
Kyrgyzstan	1.1	1.1	Kyrgyzstan	1.3	1.1
Russia	1.0	1.2	Russia	1.2	1.2
Export EEU			Import EEU		
Armenia	2.2	1.4	Armenia	1.3	1.2
Belarus	1.2	1.2	Belarus	1.1	1.3
Kazakhstan	1.0	1.3	Kazakhstan	1.1	1.2
Kyrgyzstan	1.4	1.3	Kyrgyzstan	0.9	1.1
Russia	1.2	1.3	Russia	1.3	1.2

Source: Calculated by the authors based on [19]

Tab. 3: **Initial data for the integral indicator of socio-economic development calculation (example of the Russian Federation)**

	Production of agricultural products per capita, USD	The volume of agricultural production, USD million	Indices of industrial production,%	Indices of production in the manufacturing industry,%	The volume of completed constructions, USD million	Commissioning of housing, million square meters of total area	Investments in fixed capital per capita, USD	Investments in fixed capital, USD million	Average monthly nominal wage, USD	Indices of real wages, %	Poverty level,%	Coefficient of funds	The Gini index	Consumer price index, in % to December of the previous year	Freight turnover for all modes of transport, billion t-km	Passenger turnover by all modes of transport, billion passenger-km	Index of physical GDP volume, %
2005	340	48,830	105	108	62,032	44	890	127,691	303	113	18	15	0.409	111	4,676	473	106
2006	404	57,785	106	108	86,492	51	1,217	174,026	391	113	15	16	0.415	109	4,800	477	108
2007	529	75,542	107	111	128,796	61	1,839	262,660	532	117	13	17	0.422	112	4,915	497	109
2008	695	99,194	101	101	182,511	64	2,480	353,955	697	112	13	17	0.421	113	4,948	512	105
2009	556	79,419	89	85	126,209	60	1,763	251,768	588	97	13	17	0.421	109	4,446	464	92
2010	597	85,244	107	111	146,709	58	2,110	301,452	690	105	13	17	0.421	109	4,752	484	105
2011	777	111,141	105	108	175,138	62	2,630	376,002	796	103	13	16	0.417	106	4,915	503	104
2012	750	107,531	103	105	183,911	66	2,829	405,088	857	108	11	16	0.420	107	5,056	533	104
2013	807	115,873	100	101	189,174	70	2,948.8	422,698	936	105	11	16	0.419	107	5,084	547	102
2014	778	113,750	103	103	161,317	84	2,548.6	366,148	856	101	11	16	0.416	111	5,080	556	101
2015	582	85,158	99	99	115,569	85	1,566.3	229,100	561	91	13	16	0.413	113	5,094	530	98
2016	561	82,298	101	101	107,686	80	1,504.4	220,461	549	101	13	16	0.412	105	5,185	520	100
2017	660	96,931	113	110	129,366	79	1,642	273,732	671	104	13	16	0.412	103	5,477	499	102

Source: Calculated by the authors based on [19]

Tab. 4: **Growth coefficients of the main indicators of social and economic development (example of the Russian Federation)**

	Production of agricultural products per capita, USD	The volume of agricultural production, USD million	Indices of industrial production,%	Indices of production in the manufacturing industry,%	The volume of completed constructions, USD million	Commissioning of housing, million square meters of total area	Investments in fixed capital per capita, USD	Investments in fixed capital, USD million	Average monthly nominal wage, USD	Indices of real wages, %	Poverty level,%	Coefficient of funds	The Gini index	Consumer price index, in% to December of the previous year	Freight turnover for all modes of transport, billion t-km	Passenger turnover by all modes of transport, billion passenger-km	Index of physical GDP volume,%
2005	1.188	1.183	1.063	1.084	1.394	1.161	1.367	1.363	1.293	1.133	1.171	0.956	0.986	1.017	1.027	1.007	1.017
2006	1.309	1.307	1.068	1.105	1.489	1.209	1.512	1.509	1.359	1.172	1.143	0.952	0.983	0.974	1.024	1.044	1.003
2007	1.314	1.313	1.006	1.005	1.417	1.047	1.348	1.348	1.311	1.115	0.993	1.006	1.002	0.988	1.007	1.030	0.970
2008	0.800	0.801	0.893	0.848	0.692	0.934	0.711	0.711	0.844	0.965	1.031	1.000	1.000	1.041	0.899	0.906	0.876
2009	1.074	1.073	1.073	1.106	1.162	0.975	1.197	1.197	1.173	1.052	1.040	1.000	1.000	1.000	1.069	1.043	1.133
2010	1.302	1.304	1.050	1.080	1.194	1.067	1.246	1.247	1.154	1.028	0.984	1.025	1.010	1.025	1.034	1.039	0.998
2011	0.965	0.968	1.034	1.051	1.050	1.055	1.076	1.077	1.076	1.084	1.187	0.988	0.993	0.995	1.029	1.059	0.994
2012	1.076	1.078	1.004	1.005	1.029	1.073	1.042	1.043	1.092	1.048	0.991	1.006	1.002	1.001	1.006	1.027	0.982
2013	0.964	0.982	1.025	1.032	0.853	1.194	0.864	0.866	0.914	1.012	0.964	1.019	1.007	0.956	0.999	1.016	0.989
2014	0.748	0.749	0.992	0.987	0.716	1.014	0.615	0.626	0.656	0.910	0.842	1.019	1.007	0.987	1.003	0.953	0.968
2015	0.964	0.966	1.013	1.005	0.932	0.940	0.960	0.962	0.978	1.008	0.993	1.006	1.002	1.071	1.018	0.981	1.024
2016	1.176	1.178	1.127	1.101	1.201	0.988	1.092	1.242	1.223	1.035	1.023	1.006	1.000	1.028	1.056	0.959	1.017
2017	1.188	1.183	1.063	1.084	1.394	1.161	1.367	1.363	1.293	1.133	1.171	0.956	0.986	1.017	1.027	1.007	1.017

Source: Calculated by the authors based on [19]

The integrated indicators for each EEU member country were determined based on the growth coefficients of the main indicators of socio-economic development (Table 5).

The analysis has shown that the first years of the EEU existence may be characterised as a period of economic recession (2015-2016) for all the member countries, but Kyrgyzstan. The Russian Federation (the integrated index - 0.87) and the Republic of Belarus (the integrated index - 0.84) incurred the most significant losses in 2015. At the same time, it is impossible to link negative tendencies to the EEU membership only. The decline in the integral of socio-economic development is the result of the multiplicative impact of integration processes, economic and administrative sanctions against the Russian Federation, political tension and instability (Figure 2).

The periodization of socio-economic indicators of the EEU has revealed that the economies of the member countries were in recession: a general trend is evident in all the five countries for the 2005-2015 period. However, for the last three years, the cumulative integral indicator has increased insignificantly, which indicates the relative efficiency of the EEU integration. The application of the term «relative» in this situation is not accidental, since the first positive shifts (both in terms of the growth of the integrated assessment and individual indicators of socio-economic development) were traced only in 2017. Therefore, it is premature to talk about the long-term effectiveness of the joint work of the EEU countries now.

5. Conclusion

In this study, the authors have developed a methodology for a comprehensive assessment of the EEU integration effectiveness. This methodology has a significant advantage, since it becomes possible to apply it to both:

Tab. 5: **Integral indicators of socio-economic development of the EEU countries**

	Russia	Armenia	Belarus	Kazakhstan	Kyrgyzstan
2006	1.14	1.22	1.14	1.16	1.14
2007	1.19	1.21	1.12	1.15	1.19
2008	1.13	1.11	1.17	1.11	1.23
2009	0.88	0.86	0.95	1.00	0.99
2010	1.08	1.07	1.13	1.05	0.99
2011	1.11	1.04	0.90	1.13	1.12
2012	1.04	0.98	1.11	1.07	1.06
2013	1.03	0.98	1.09	1.08	1.07
2014	0.98	1.02	1.02	0.99	1.05
2015	0.87	0.94	0.84	0.96	1.01
2016	0.99	0.95	0.92	0.92	1.03
2017	1.09	1.05	1.09	1.09	1.04

Source: Calculated by the authors based on [19]

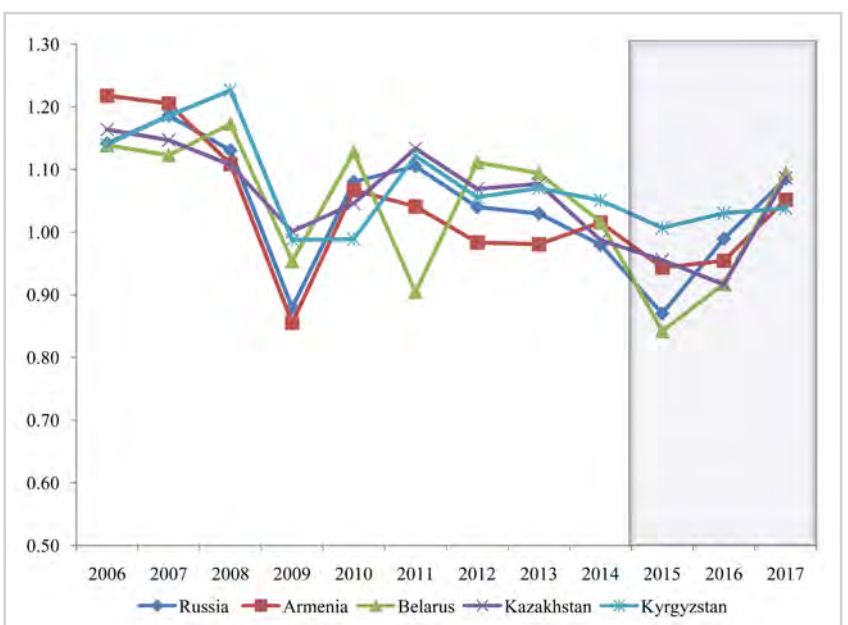

Fig. 2: **Periodization of socio-economic indicators of the EEU countries**
Source: Calculated by the authors based on [19]

the level of the Eurasian Economic Union as a whole and individual participants in particular. The approbation of the integral indicator revealed economic recession in the EEU countries in 2005-2015, yet their integration led to first positive results in the short term. These results are associated with the increase in indicators of socio-economic growth in Russia, Kazakhstan, Belarus, Armenia and Kyrgyzstan.

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