Inflationary transmission channel of integration spillover effects: assessment of the impact on the welfare of the EAEU member states' population

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Abstract. Integration processes generate so-called "spillover effects", which have an impact on the welfare of the population of the countries involved in integration processes. The purpose of the study is to assess the inflationary channel of the integration spillover effects on the EAEU member countries population welfare. The hypothesis of the study is that there should be an inverse (statistically significant) relationship between inflation in Russia and the EAEU member countries population welfare. "Inflationary shocks" coming from the Russian economy (through the channel of mutual trade); in the conditions of open borders in the EAEU space it will spread to the Union States. At the same time, they will reduce the population living standards through the growth of Consumer price index, increase in Gini index, decrease in average monthly net salary (after tax), and Human Development Index. We used correlation analysis to test the hypothesis proposed. As a result, the hypothesis proposed in the paper was generally not confirmed by the data characterising the EAEU member states economy over the long term time period. The data analysis showed that inflation in Russia has no impact on the population living standards in the EAEU member states (except for Kazakhstan: a direct statistically significant correlation was found between the dynamics of inflation in Russia and its average net salary).

Keywords: inflation, spillover effects, correlation analysis, EAEU, integration, population welfare.

JEL codes: E31, F15

Funding: The research was supported by the Russian Science Foundation grant No. 23-28-01774, https://rscf.ru/project/23-28 01774/

For citation: Maksim I. Markin & Marina A. Mayorova (2023). Inflationary transmission channel of integration spillover effects: assessment of the impact on the welfare of the EAEU member states' population. *Journal of regional and international competitiveness* 4(3), 16.

Introduction

The Eurasian Economic Union (EAEU) generates not only static and dynamic integration effects described in the classical economic literature (Salera, 1951), but also so-called spillover effects. Economic processes and phenomena are integrated from one economy to another, affecting the well-being of these countries population. Russia, as the largest economy of the Eurasian Economic Union (EAEU), acts as the main generator of economic impulses / "shocks" for the other member states of the economic association.

There are five channels of transmission of spillover effects in the EAEU space: the channel of labour resources transfer; the channel of capital transfer; the inflation channel; the currency channel; the channel of intra-industry trade.

The purpose of this paper is to assess the influence of the inflationary channel of integration spillover effects on the population welfare of the EAEU member states. We assume that high inflation in Russia spills over to the rest of the member states of the economic association, which causes prices increasing and lower welfare of the EAEU residents.

A similar view on the nature of spillover effects and the inflationary propagation channel was studied in a number of researchers.

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Thus, Afanasiev (2014) considers spillover effects in the context of chain spreading of crisis phenomena: "The effect occurs when a crisis from one country 'spills over' to another, and they, in turn, affect a third country". The crisis spillover effect is a logical phenomenon in the context of trade and financial integration of countries in the global economy.

According to Kalinkova (2012), the mutual dynamics of business fluctuations among the G-8 countries is volatile and unstable. Nevertheless, the spillover effect becomes distinctly stationary in its fluctuations: in the global economy the US and Japan are the main net transmitters of economic shocks, while Germany is the largest net recipient of economic shocks in the period of 2000-2012.

Qabhobho & Khobai (2022): the findings indicated that the fixed-exchange-rate regimes (soft pegs and hard pegs) are associated with high responsiveness of the domestic inflation rate to the foreign countries' inflation rates, rather than to floating exchange-rate regimes (free-floating and managed floats). The policy implications for control of inflation in SADC economies are that, because of the financial market integration increase between SADC and BRIC economies, monetary authorities in SADC countries should consider floating exchange rate regimes (managed-floats or free-floating).

Zhang (2022): this paper explores the international spillover effects of China's government spending onto global inflation dynamics and the role of the oil price channel in the transmission process based on a monthly dataset covering 20 OECD economies spanning from January 2000 to September 2021. Based on the estimation results of Large Bayesian VAR models this paper provides three novel findings to the literature. Firstly, China's government spending expansion significantly raises the CPI of most OECD economies. Secondly, the oil price rises significantly in response to China's government spending expansion and magnifies its spillover effect on global CPI inflation. Thirdly, the effect of the oil price channel on the international transmission of China's government spending to the global inflation dynamics crucially depends on the oil import dependence rate and the energy subsidies of the shock recipient countries.

Ntshangase, Zhou & Kaseeram (2023): this study employs the panel vector autoregressive (PVAR) model to examine the spillover effect of US unconventional monetary policy on inflation and non-inflation targeting emerging markets post credit crunch and during COVID-19 from 2000Q1 to 2020Q4. According to the empirical results, the US unconventional monetary policy induces a surge in the exchange rate and a decrease in the central bank policy rate for both inflation and non-inflation targeting emerging markets. However, there was no significant impact on the equity prices. The empirical results are statistically significant, robust, and consistent with previous studies except for the response of equity prices.

Guirguis, Dutra & McGreevy (2022): this paper introduces a new global inflation measure based on the principal component analysis (PCA) of the inflation rates of major US trade partners. Authors find that US domestic inflation correlates strongly with global inflation in the short- and long term. Moreover, global inflation leads the US inflation and accounts for 80% of the price discovery process. In summary, the present results support the hypothesis that global inflation is a crucial determinant of domestic (US) inflation.

Zhao (2022): the implications of trend inflation in an open economy are investigated in a two-country DSGE model. The results show that increasing trend inflation from 2 to 4 percent in the domestic country generates a consumption-equivalent welfare loss of about 0.36 percent and 0.04 percent in the domestic and foreign countries, respectively. Incorporating trend inflation in an open economy has new dynamics: domestic trend inflation amplifies the spillover effects of a domestic technology shock on foreign countries; trend inflation in foreign countries reinforces these spillover effects through the effect of price dispersion.

Hall, Tavlas & Wang (2023): authors find the inflationary shocks in the United States are transmitted to the euro area and the United Kingdom in a powerful and consistent way. The euro area transmits inflation to the other regions but to a lesser extent, while the inflation in the United Kingdom has little effect on the other two regions.

Golitsis, Gkasis & Bellos (2022): this paper focuses on the price determinants of gold, and on the challenges associated with gold's safe haven property. The findings identify gold as a strong dollar hedge, while crude oil and Treasury bills appear to drive inflation; they also indicate strong spillover effects between exchange rate and gold returns. In general, co-movement dynamics display state-dependent characteristics.

Both total and directional spillovers increase significantly during market turbulence caused by severe financial crises such as the Global Financial Crisis (GFC) of 2007-2009 and the European Sovereign Debt Crisis of 2010-2012. Net spillovers switch between positive and negative values for all these markets, implying that the recipient/transmitter position changes drastically with market events. Economic policy uncertainty, stock market returns, and crude oil price returns are the main transmitters, while Treasury bills and CPI are the main return shock recipients. Gold and exchange rate act both as receivers and transmitters over the sample period.

Goczek & Witkowski (2023): authors analyze the effects of the European Central Bank's (ECB) unconventional monetary policy spillovers on the inflation-targeting Central Eastern European (CEE) countries using daily panel data from 2000 to 2019. Overall, they find that the spillovers from the unconventional ECB policy are not different from the conventional spillovers and are generally insignificant. The main result is that the international spillovers manifest themselves through the risk-taking channel, not the bond/interest rate channel, and have the form of volatility co-movement.

Course of the study: at the first stage we will verify the existence of a relationship between inflation rates in the EAEU member countries; at the second stage we will assess the impact of inflation in Russia on the dynamics of socio-economic indicators characterising the welfare of residents of the EAEU member countries.

Our previous work found that the correlation coefficient is not statistically significant, hence inflation in Russia has no impact on inflationary processes in the EAEU member countries (Mayorova, Markin & Tkachenko, 2023). Therefore, the hypothesis proposed at the first stage of the study was not generally confirmed by the data characterising the economy of the EAEU member states in the long-term period.

Methods

The hypothesis of the second study stage dwells on the existence of the inverse (statistically significant) relationship between inflation in Russia and the welfare of the EAEU member countries population. "Inflationary shocks" coming from the Russian economy (through the channel of mutual trade); in the conditions of open borders in the EAEU space it will spread to the Union States. At the same time, they will reduce the population living standards through the growth of Consumer price index, increase in Gini index, decrease in average monthly net salary (after tax), and Human Development Index.

Research methodology:

1. The data used in the study are presented in Table 1.
2. Sample: 5 EAEU member states.
3. Study interval: long-term, 13-year time interval (2010-2022).
4. Research methods: correlation analysis. Correlation analysis (significance level 5%) was used to verify the relationship between the indicators under study; the data were processed in the software package "Statistica" by StatSoft.

Table 1 – Indicators under study, 2010-2022 (annual, %)

	Series Name	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Belarus	Consumer price index (2010 = 100)	100	153.2	243.9	288.6	340.9	387.0	432.9	459.0	481.3	508.0	536.5	587.3	676.6
	Gini index	28.6	27.2	26.5	26.6	27.2	25.6	25.3	25.4	25.2	25.3	24.4	..	..
	Average Monthly Net Salary (After Tax)	471.8	339.7	402.7	529.7	520.5	354.5	344.9	389.0	442.9	467.7	426.7	424.9	392.9
	Human Development Index	0.790	0.797	0.806	0.808	0.812	0.812	0.813	0.817	0.818	0.817	0.807		

	Series Name	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Armenia	Consumer price index (2010 = 100)	100	107.6	110.4	116.7	120.2	124.7	123.0	124.2	127.3	129.1	130.7	140.1	152.2
	Gini index	30	29.4	29.6	30.6	31.5	32.4	32.5	33.6	34.4	30	25.1	27.9	..
	Average Monthly Net Salary (After Tax)	375.0	321.0	295.0	350.0	358.0	269.4	309.0	291.3	333.2	324.0	370.2	388.5	445.5
	Human Development Index	0.746	0.750	0.755	0.760	0.764	0.766	0.765	0.768	0.771	0.778	0.757	0.759	
Kyrgyz Republic	Consumer price index (2010 = 100)	100	116.6	119.9	127.8	137.4	146.4	146.9	151.6	153.9	155.7	165.5	185.2	211.0
	Gini index	30.1	27.8	27.4	28.8	26.8	29	26.8	27.3	27.7	29.7	29	..	..
	Average Monthly Net Salary (After Tax)	162.0	197.3	207.1	236.0	242.8	263.5	202.2	229.4	232.3	233	264.7	235.4	297.5
	Human Development Index	0.664	0.665	0.675	0.682	0.688	0.690	0.693	0.696	0.698	0.698	0.689	0.692	
Kazakhstan	Consumer price index (2010 = 100)	100	108.4	113.9	120.6	128.7	137.2	157.2	168.9	179.1	188.5	201.2	217.4	..
	Gini index	28	28	28.2	27.1	27	26.8	27.2	27.5	27.8	..	..	..	..
	Average Monthly Net Salary (After Tax)	400	477.1	536.8	753.4	757.1	731.7	407.2	415.0	421.6	426. 1	453.8	455.6	564.6
	Human Development Index	0.767	0.775	0.783	0.792	0.799	0.805	0.805	0.811	0.814	0.819	0.814	0.811	
Russian Federation	Inflation, consumer prices (annual %)	6.84	8.44	5.07	6.75	7.82	15.5	7.04	3.68	2.87	4.47	3.38	6.69	11.94

Source: World Bank Database, 2023

Results

The results of the correlation analysis are presented graphically on Figures 1, 3, 5, 7, 9.

We see increasing of one variable, while other variable also increases. It may indicate a positive relationship between the two variables, although there is irregularity in the distribution of the variables under study. We verify this relationship by calculating Spearman correlation coefficients.

```
    Pearson's product-moment correlation
data: Russian_ Federation and Belarus
t = 0.49454, df = 10, p-value = 0.6316
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 -0.4601988  0.6690820
sample estimates:
      cor
0.1545104
    Pearson's product-moment correlation
data: Russian_ Federation and Armenia
```

```
t = 0.97973, df = 10, p-value = 0.3503
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 -0.3348294  0.7435556
sample estimates:
      cor
0.2959397
    Pearson's product-moment correlation
data: Russian_Federation and Kyrgyz_Republic
t = 1.2288, df = 10, p-value = 0.2473
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 -0.2672637  0.7750001
sample estimates:
      cor
0.3621921
    Pearson's product-moment correlation
data: Russian_Federation and Kazakhstan
t = 0.43572, df = 10, p-value = 0.6723
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 -0.4745805  0.6587922
sample estimates:
      cor
0.1364981
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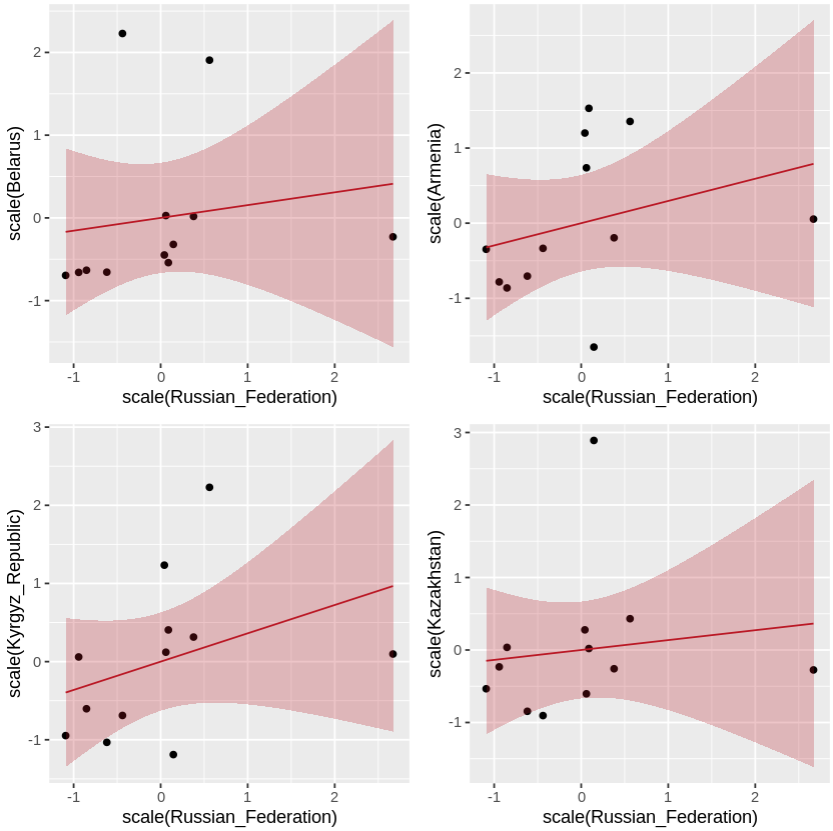

Figure 1. Correlation area between inflation dynamics in Russia and Consumer price index in EAEU countries

Source: composed by the authors

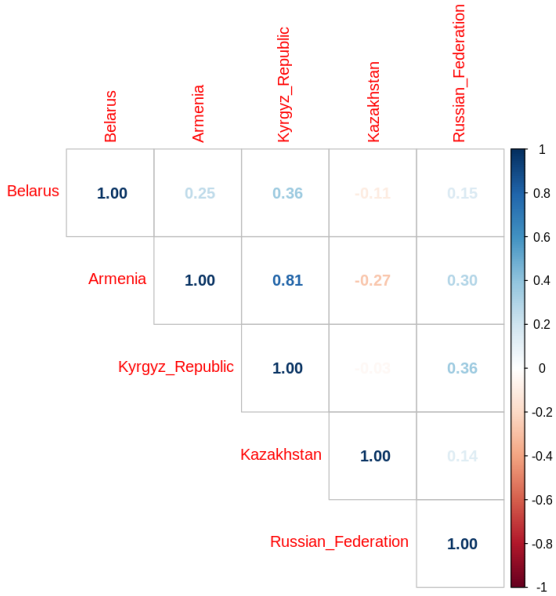

Figure 2. Final results of the correlation analysis
Source: composed by the authors

The correlation coefficient is not statistically significant. Hence, the relationship between the two variables is not linear; there is no significant influence of the variables under study.

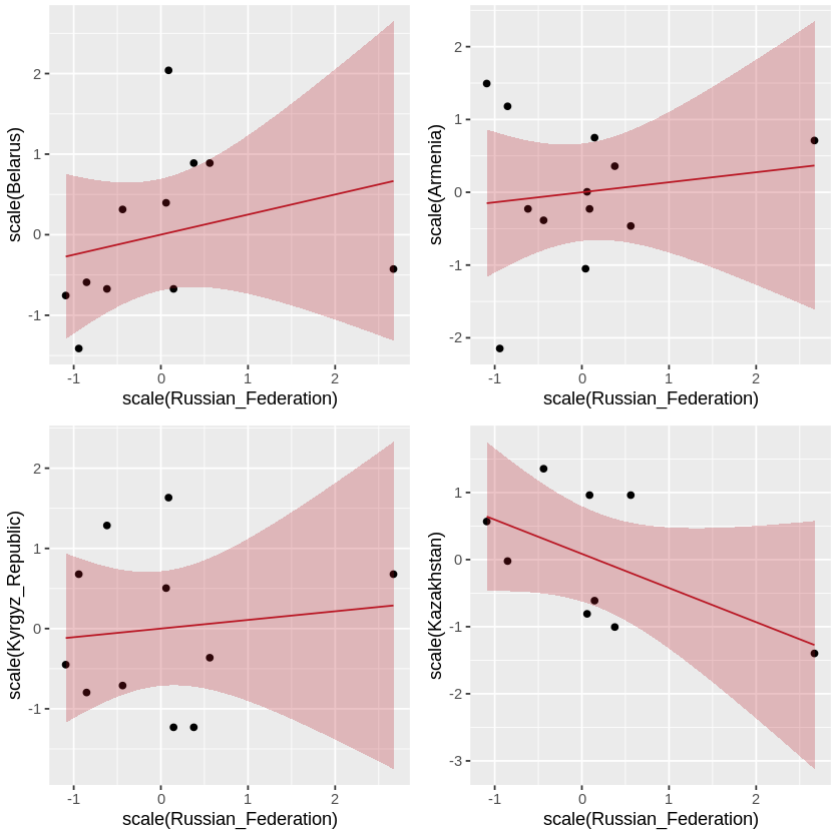

Figure 3. Correlation area between inflation dynamics in Russia and Gini index in EAEU countries
Source: composed by the authors

Pearson's product-moment correlation
data: Russian_Federation and Belarus
t = 0.81222, df = 9, p-value = 0.4376
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:

```
 -0.4014829  0.7444946
sample estimates:
      cor
0.2613309
    Pearson's product-moment correlation
data: Russian_Federation and Armenia
t = 0.43932, df = 10, p-value = 0.6698
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 -0.4737064  0.6594300
sample estimates:
      cor
0.1376046
    Pearson's product-moment correlation
data: Russian_Federation and Kyrgyz_Republic
t = 0.34116, df = 9, p-value = 0.7408
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 -0.5222839  0.6676154
sample estimates:
      cor
0.1129921
    Pearson's product-moment correlation
data: Russian_Federation and Kazakhstan
t = -1.7604, df = 7, p-value = 0.1217
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 -0.8904761  0.1742855
sample estimates:
      cor
-0.5539546
```

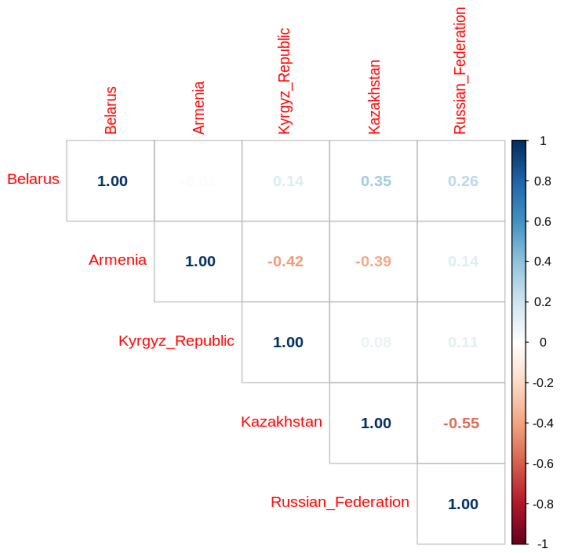

Figure 4. Final results of the correlation analysis

Source: composed by the authors

The correlation coefficient is not statistically significant. Hence, the relationship between the two variables is not linear; there is no significant influence of the variables under study.

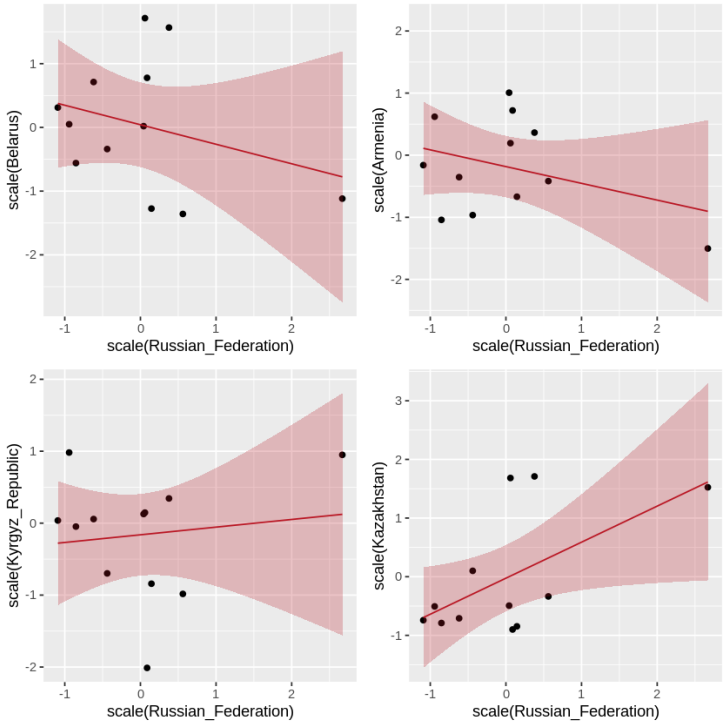

Figure 5. Correlation area between inflation dynamics in Russia and average net salary in EAEU countries
Source: composed by the authors

```
Pearson's product-moment correlation
data: Russian_Federation and Belarus
t = -0.98195, df = 10, p-value = 0.3493
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 -0.7438558  0.3342329
sample estimates:
       cor
-0.2965524
    Pearson's product-moment correlation
data: Russian_Federation and Armenia
t = -1.162, df = 10, p-value = 0.2722
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 -0.7669880  0.2855108
sample estimates:
       cor
-0.3449053
    Pearson's product-moment correlation
data: Russian_Federation and Kyrgyz_Republic
t = 0.40036, df = 10, p-value = 0.6973
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 -0.4831253  0.6524711
sample estimates:
      cor
0.1256014
    Pearson's product-moment correlation
data: Russian_Federation and Kazakhstan
t = 2.3153, df = 10, p-value = 0.04312
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 0.02548926 0.86977077
```

sample estimates:
cor
0,5907492

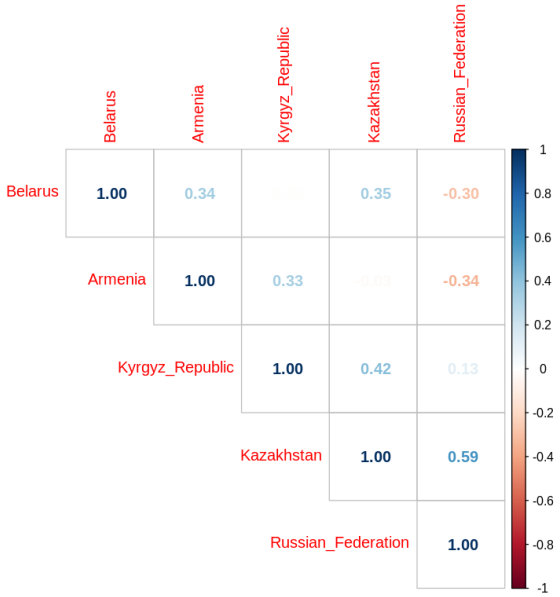

Figure 6. Final results of the correlation analysis

Source: composed by the authors

The correlation coefficient is not statistically significant (except Kazakhstan). Hence, the relationship between the two variables is not linear; there is no significant influence of the variables under study.

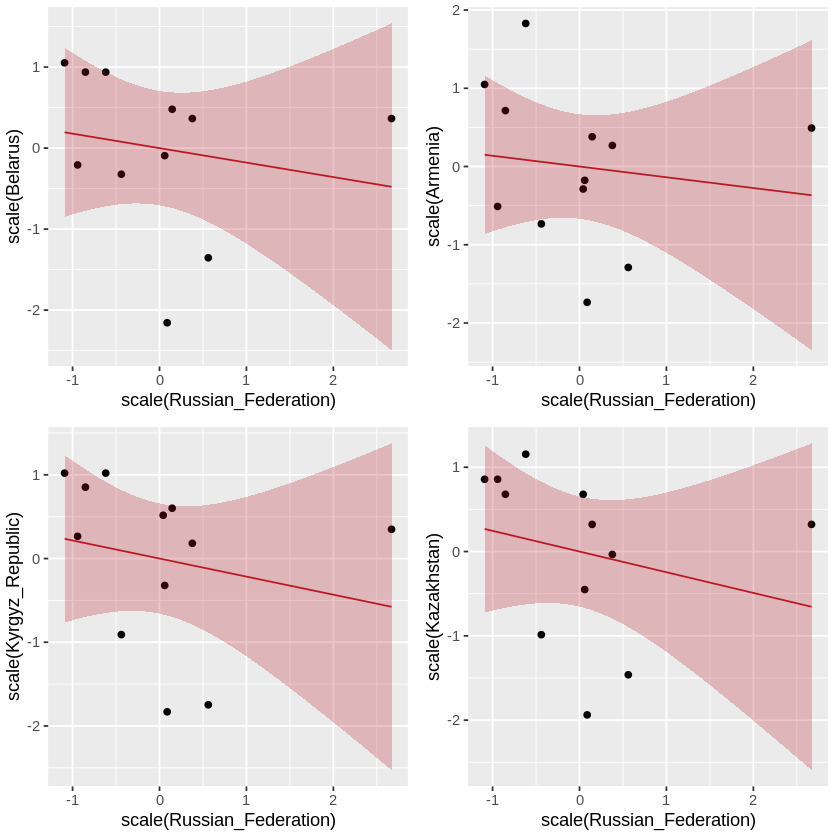

Figure 7. Correlation area between inflation dynamics in Russia and Human Development Index in EAEU countries

Source: composed by the authors

```
 Pearson's product-moment correlation
 data: Russian_Federation and Belarus
 t = -0.5723, df = 9, p-value = 0.5811
 alternative hypothesis: true correlation is not equal to 0
 95 percent confidence interval:
  -0.7077096  0.4647269
 sample estimates:
       cor
-0.1873877

    Pearson's product-moment correlation
 data: Russian_Federation and Armenia
 t = -0.43893, df = 10, p-value = 0.67
 alternative hypothesis: true correlation is not equal to 0
 95 percent confidence interval:
  -0.6593612  0.4738007
 sample estimates:
       cor
-0.1374852

    Pearson's product-moment correlation
 data: Russian_Federation and Kyrgyz_Republic
 t = -0.69907, df = 10, p-value = 0.5004
 alternative hypothesis: true correlation is not equal to 0
 95 percent confidence interval:
  -0.7027058  0.4086727
 sample estimates:
       cor
-0.2158551

    Pearson's product-moment correlation
 data: Russian_Federation and Kazakhstan
 t = -0.8007, df = 10, p-value = 0.4419
 alternative hypothesis: true correlation is not equal to 0
 95 percent confidence interval:
  -0.7181888  0.3822980
 sample estimates:
       cor
-0.2454573
```

The correlation coefficient is not statistically significant. Hence, the relationship between the two variables is not linear; there is no significant influence of the variables under study.

Discussion

The data analysis showed that the correlation coefficient is not statistically significant. Hence, inflation in Russia has no impact on the welfare of the EAEU member states population (except for Kazakhstan: a direct statistically significant relationship between the dynamics of inflation in Russia and average net salary was revealed). Thus, the hypothesis proposed was not generally confirmed by the data characterising the EAEU member states economy in the long-term interval.

It is important to realize, the results obtained should be interpreted carefully, as they are depend on the sample size and other model limitations.

Research limitations:

- under-fetching data and short study interval;

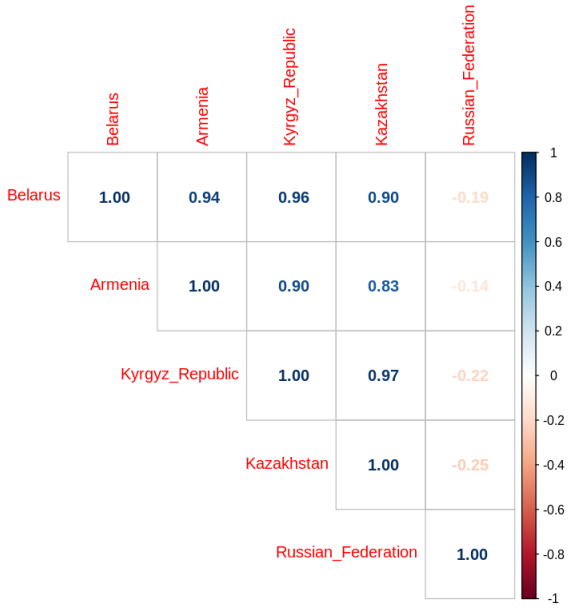

Figure 8. Final results of the correlation analysis

Source: composed by the authors

- data outliers distorting the overall result, influenced by the coronavirus pandemic and subsequent lockdown in 2019 and 2020; economic sanctions against Russia since 2014; and the start of the Special Military Operation in 2022;

- strong disagreement in the dynamics of economic development and living standards in the EAEU member states, volatility of national currencies exchange rates and the Monetary Policy of national Megaregulators (which also causes the issue of data outflow);

- perhaps the use of correlation analysis for the research task was not optimal (the research methodology is being tested and searched for appropriate to the research tasks).

We hope that the data obtained as a result of the study and the problems solved will activate a new wave of applied research on the spillover effects impact on the EAEU member states residents'well-being.

FUNDING

The study was funded by the Russian Science Foundation grant No. 23-28-01774

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR'S CONTRIBUTION

Mayorova M.A. – Conceptualization, Project administration, Writing – review & original draft
Markin M.I. – Formal Analysis, Validation, Data curation

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Received 12.06.2023
Revised 19.07.2023
Accepted 06.08.2023