THE EVOLUTION OF THE MAIN MILITARY STATISTICAL INDICATORS IN ROMANIA (2004-2015)

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In this paper we analyzed the evolution of the main military statistical indicators in Romania from 2004 until 2015 as provided by the World Bank: Armed forces personnel (total), Armed forces personnel (% of total labor force), Military expenditure (% of central government expenditure), Military expenditure (% of GDP), Military expenditure (current LCU).

Key words: *dynamic indices, changing rates of dynamic rhythms, average of dynamic indices, average rhythm of changing, increase, decrease, armed forces, military expenditure.*

1. INTRODUCTION

Romania is a NATO member country since 2004. That is why we considered important to analyze some of the data concerning military expenditure and armed forces personnel from that year until the last available data, in 2015.

We have chosen 6 statistical indicators: Armed forces personnel (total), Armed forces personnel (% of total labor force), Military expenditure (% of central government expenditure), Military expenditure (% of GDP), Military expenditure (current LCU) and GDP (current LCU). (1)

2. METHODS

For the analysis of the data we used the relative and average indicators of time series. First we calculated the dynamic indices with fixed base

$$i_{t/1\%} = \frac{y_t}{y_1} \cdot 100 \qquad (1)$$

and the dynamic indices with chain base

$$i_{t/t-1\%} = \frac{y_t}{y_{t-1}} \cdot 100 \qquad (2)$$

Second we calculated the changing rates of dynamic rhythms with fixed base

$$r_{t/1\%} = (i_{t/1} - 1) \cdot 100 \qquad (3)$$

and the changing rates of dynamic rhythms with chain base.

$$r_{t/t-1\%} = (i_{t/t-1} - 1) \cdot 100 \qquad (4).$$

Third, we calculated the average of dynamic indices

$$= \sqrt[n-1]{\prod_{t=2}^{n} i_{t/t-1}} = \sqrt[n-1]{i_{n/}} \qquad (5)$$

and the average rhythm of changing

$$\bar{r}_{\%} = \bar{i}_{\%} - 100 \qquad (6)$$

3. RESULTS AND DISCUSSION

The first indicator that we analyzed was Armed forces personnel as percent of total labor force. As you can see in **Table 1**. Compared with the percent from 2004, this indicator was always decreased, with the exception of the percent from 2005. If we compare the percent from the year analyzed with the one from the previous year, the situation fluctuates, meaning the percent increases and then decreases.

Table 1. Dynamic indices of Armed forces personnel (% of total labor force) in Romania

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Armed forces personnel (% of total labor force)	1.746	1.812	1.551	1.563	1.596	1.605	1.637	1.635	1.628	1.634	1.606	1.608
$i_{t/1\%}$		103.736	88.797	89.478	91.401	91.890	93.719	93.621	93.235	93.539	91.948	92.065
$i_{t/t-1\%}$		103.736	85.598	100.767	102.150	100.535	101.990	99.895	99.588	100.326	98.300	100.127

In **Table 2** we can see the exact percentages of increase or decrease. For example, in the year 2005 compared with the year 2004, the percent of Armed forces personnel increased with 3.736%. In the year 2006 compared with the year 2004, the percent of Armed forces personnel decreased with 11.203%. The biggest decrease was in 2006 compared with 2005 – 14.402%. The biggest increase was in 2010 compared with 2009, but it was only for 1.990%, an insignificant percent in reality. The general trend from 2005 until 2015 was one of decrease.

Table 2. Changing rates of dynamic rhythms of Armed forces personnel (% of total labor force) in Romania

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Armed forces personnel (% of total labor force)	1.746	1.812	1.551	1.563	1.596	1.605	1.637	1.635	1.628	1.634	1.606	1.608
$r_{t/1\%}$		3.736	-11.203	-10.522	-8.599	-8.110	-6.281	-6.379	-6.765	-6.461	-8.052	-7.935
$r_{t/t-1\%}$		3.736	-14.402	0.767	2.150	0.535	1.990	-0.105	-0.412	0.326	-1.700	0.127

In **Table 3** and in **Table 4** we analyzed the Military expenditure as percent of GDP. This time, for all the years from 2005 until 2015 the trend was one of decrease, with the biggest fluctuation in 2010 (-38.146) and 2012 (-38.984%), compared with the data from 2004.

Also for the comparison with the previous year, we can observe the constant decrease of Military expenditure from 2004 until 2010. And then in 2011, 2013, 2014 and 2015 we can see a minor increase, the biggest one from 2014 to 2015 was of 7.747%.

Table 3. Dynamic indices of Military expenditure (% of GDP) in Romania

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Military expenditure (% of GDP)	2.008	1.982	1.823	1.520	1.441	1.329	1.242	1.284	1.225	1.280	1.349	1.454
$i_{t/1\%}$		98.719	90.781	75.718	71.786	66.200	61.854	63.950	61.016	63.774	67.200	72.406
$i_{t/t-1\%}$		98.719	91.959	83.408	94.807	92.218	93.435	103.389	95.412	104.520	105.372	107.747

Table 4. Changing rates of dynamic rhythms of Military expenditure (% of GDP) in Romania

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Military expenditure (% of GDP)	2.008	1.982	1.823	1.520	1.441	1.329	1.242	1.284	1.225	1.280	1.349	1.454
$r_{t/1\%}$		-1.281	-9.219	-24.282	-28.214	-33.800	-38.146	-36.050	-38.984	-36.226	-32.800	-27.594
$r_{t/t-1\%}$		-1.281	-8.041	-16.592	-5.193	-7.782	-6.565	3.389	-4.588	4.520	5.372	7.747

In **Tables 5** and **6** we analyzed the Military expenditure as percent of central government expenditure. Compared with the year 2004 until 2015 we can see a constant decrease from 1.518% in 2005 to 31.247% in 2015, the biggest one being in 2010 – 45.263%.

Compared with the previous year, we can see the biggest increase from 2012 to 2013 of 10.808%, and also small increases from 2013 to 2014 (4.356%) and from 2014 to 2015 (4.913%).

Table 5. Dynamic indices of Military expenditure (% of central government expenditure) in Romania

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Military expenditure (% of central government expenditure)	6.457	6.359	5.783	4.489	4.315	3.669	3.534	3.678	3.659	4.055	4.232	4.439
$i_{t/1\%}$		98.482	89.565	69.516	66.820	56.816	54.737	56.957	56.673	62.798	65.533	68.753
$i_{t/t-1\%}$		98.482	90.946	77.615	96.121	85.029	96.340	104.057	99.502	110.808	104.356	104.913

Table 6. Changing rates of dynamic rhythms of Military expenditure (% of central government expenditure) in Romania

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Military expenditure (% of central government expenditure)	6.457	6.359	5.783	4.489	4.315	3.669	3.534	3.678	3.659	4.055	4.232	4.439
$r_{t/1\%}$		-1.518	-10.435	-30.484	-33.180	-43.184	-45.263	-43.043	-43.327	-37.202	-34.467	-31.247
$r_{t/t-1\%}$		-1.518	-9.054	-22.385	-3.879	-14.971	-3.660	4.057	-0.498	10.808	4.356	4.913

For the rest of the selected indicators – Armed forces personnel (total), Military expenditure (current LCU) and GDP (current LCU) we made a graphical analysis, as you can see in **Figure no. 1** and **Figure no. 2**.

For the Armed forces personnel we can observe the constant decrease, especially the abrupt one from 2005 to 2006, from 177000 persons to 154000 persons.

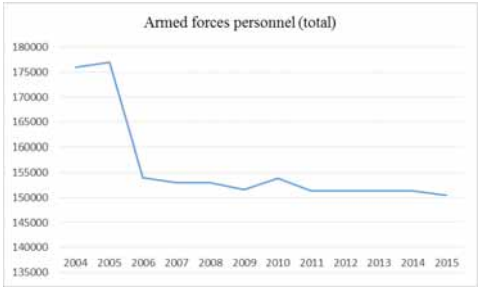

Fig. no. 1. Evolution of Armed forces personnel (total) in Romania between 2004 – 2015

For the Military expenditure we can observe a general increase, with only 2 decreases, from 2008 to 2009 and from 2009 to 2010. For the GDP we can also observe a general increase, with only one decrease of values, from 2008 to 2009. See the comparison in Figure no. 2 below.

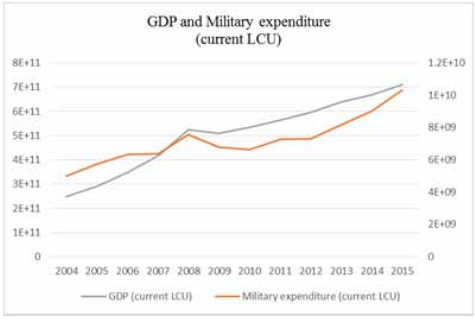

Fig. no. 2. Comparative evolution of GDP (current LCU) and Military expenditure (current LCU) in Romania between 2004 – 2015

For the Military expenditure and GDP the minimum value was in 2004 and the maximum value was in 2015. For the Armed forces personnel the minimum value was registered in 2015 and the maximum value in 2005.

As you can see in **Figure no. 3** and **Figure no. 4**, the statistical connection between the Armed forces personnel and Military expenditure is an indirect connection, meaning the personnel decreased when the expenditure increased. We have the same indirect connection also between Armed forces personnel and GDP.

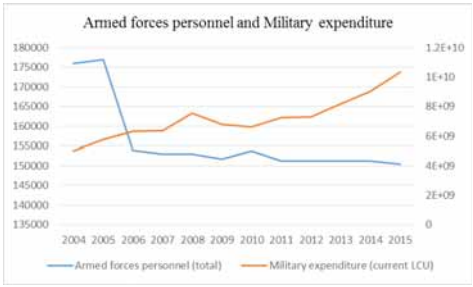

Fig. no. 3. Comparative evolution of Armed forces personnel (total) and Military expenditure (current LCU) in Romania between 2004 – 2015

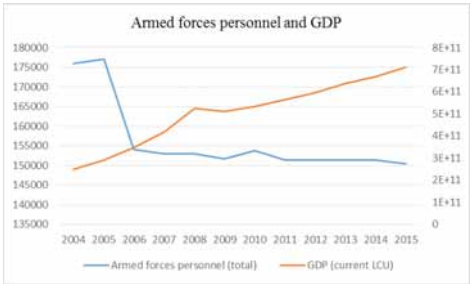

Fig. no. 4. Comparative evolution of Armed forces personnel (total) and GDP (current LCU) in Romania between 2004 – 2015

The indirect connection between the 3 indicators is also reflected by the correlation coefficient, calculated with the formula:

$$r = \frac{n\sum_{i=1}^{n} x_i y_i - \sum_{i=1}^{n} x_i \sum_{i=1}^{n} y_i}{\sqrt{[n\sum_{i=1}^{n} x_i^2 - (\sum_{i=1}^{n} x_i)^2] \cdot [n\sum_{i=1}^{n} y_i^2 - (\sum_{i=1}^{n} y_i)^2]}}$$

The 2 correlation coefficients are r(AFP,ME) = -0.652 and r(AFP,GDP) = -0.794 showing a medium intensity connection and a strong connection, respectively.

4. CONCLUSIONS

In this paper we have analyzed 6 statistical military indicators in Romania, between 2004 and 2015. The general conclusions are best illustrated by the values of the 2 average indicators of time series: $\bar{i}$ - the average of dynamic indices and $\bar{r}$ - the average rhythm of changing.

Armed forces personnel (total) registered a medium decrease from a year to another of $\bar{i}$ = 0.985 or a $\bar{r}$ = - 1.418%.

Armed forces personnel (% of total labor force) registered a medium decrease from a year to another of $\bar{i}$ = 0.993 or a $\bar{r}$ = - 0.749%.

Military expenditure (% of GDP) registered a medium decrease from a year to another of $\bar{i}$ = 0.971 or a $\bar{r}$ = - 2.893%.

Military expenditure (% of central government expenditure) registered a medium decrease from a year to another of $\bar{i}$ = 0.967 or a $\bar{r}$ = - 3.349%.

Military expenditure (current LCU) registered a medium increase from a year to another of $\bar{i}$ = 1.068 or a $\bar{r}$ = + 6.837%.

GDP (current LCU) registered a medium increase from a year to another of $\bar{i}$ = 1.100 or a $\bar{r}$ = + 10.019%.

In conclusion, even if the GDP and the Military expenditure (current LCU) registered an increase, the Armed forces personnel registered a decrease.

NOTES

(1) LCU – Local Currency Unit

(2) Armed forces personnel are active duty military personnel, including paramilitary forces if the training, organization, equipment, and control suggest they may be used to support or replace regular military forces. Labor force comprises all people who meet the International Labour Organization's definition of the economically active population.

(3) Military expenditures data from SIPRI are derived from the NATO definition, which includes all current and capital expenditures on the armed forces, including peacekeeping forces; defense ministries and other government agencies engaged in defense projects; paramilitary forces, if these are judged to be trained and equipped for military operations; and military space activities. Such expenditures include military and civil personnel, including retirement pensions of military personnel and social services for personnel; operation and maintenance; procurement; military research and development; and military aid (in the military expenditures of the donor country). Excluded are civil defense and current expenditures for previous military activities, such as for veterans' benefits, demobilization, conversion, and destruction of weapons. This definition cannot be applied for all countries, however, since that would require much more detailed information than is available about what is included in military budgets and off-budget military expenditure items. (For example, military budgets might or might not cover civil defense, reserves and auxiliary forces, police and paramilitary forces, dual-purpose forces such as military and civilian police, military grants in kind, pensions for military personnel, and social security contributions paid by one part of government to another.)

(4) GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current local currency.

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