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DISTRIBUTION OF POWER IN THE VISEGRAD COUNTRIES. A POWERMETRIC APPROACH

Abstract:

The article presents the results of research on the distribution of power in the four states of the Visegrad Group (Poland, Hungary, the Czech Republic, and the Slovak Republic) in the prospect of a powermetric approach, according to the synthetic formal model of measurement of economic power, military power, and geopolitical power of the state and its derivative indicators, which strengthen or weaken the position of the state in the system. This model has been developed by the Polish researcher Mirosław Sułek (Warsaw University). The regional distribution of all three categories of power of VG states has a unipolar structure, which is dominated by Poland with over fifty percent share in the total regional power of the VG structure. Assessment of the distribution of power is the first step to a comprehensive evaluation of the game of power and the game of interests in every international system.

Keywords: Visegrad Group, V4, VG, powermetrics, economic power, military power, geopolitical power, militarization.

Introduction

The Visegrad Group (VG) was founded on February 15, 1991, due to a joint declaration signed by presidents Wałęsa (Poland), Havel (Czechoslovakia) and Antall (Hungary) in a Hungarian city of Visegrád under the US political auspices, indicating the goals and terms of intergovernmental cooperation. In 1993, after the collapse of Czechoslovakia, the Czech Republic and Slovakia joined the format as separate states. It has not been created as an Intergovernmental Organization (IGO), but the group of independent states belonging to the former post communist region decided to build an internal dialogue to join the economic and security institutions of the western hemisphere. These goals have been achieved in large part. In 1999, Poland, the Czech Republic, and Hungary joined NATO and Slovakia did it five years later.

In 2004, all VG states joined the EU. What brought the countries together was their geographical proximity. However, from the beginning, the group was not unified in political, historical, cultural, and economic terms, due to large differences between the national interests of the member states. They also competed during ongoing parallel negotiations on their way to membership in the EU and NATO and were not loyal to each other. There are still many different national and geopolitical interests (political, economic, military, cultural) dividing the VG states. These indicators strengthen or weaken the geopolitical position of each state during its game of power and interest in the system. This paper focuses on the determination of the distribution of power in the VG states. The study covers the period 1992-2019 conditioned on the data availability.

Research methods

The methodological basis of research in the area of powermetrics is the well-known thesis of Raymond Aron (2017), according to which the distribution of power is the most important feature of any international system, since power is the ability to create, or destroy. By competing for the highest position in the international system, states strive to increase their strength, power, potential, position, significance, influence, prestige, and authority, i.e., using the terminology introduced by the outstanding Polish cyberneticist Marian Mazur (1976), they strive to increase sociological strength called power in the case of states and usually authority in internal relations. Limited resources force people to compete in two forms: cooperation and struggle, including armed conflict. As a result, there are three subsystems of human action, named on the basis of a terminological convention: cooperation and struggle in the real sphere and competition in the regulatory sphere. Cooperation is a positive-sum game (all parties involved benefit, albeit to a different extent), struggle is a negative-sum game (all parties involved suffer losses, albeit to a different extent), while competition is a zero-sum game. This means that an increase in the power of one state must occur at the expense of other states, and vice versa – a decrease in the power of one state is an increase in the power of other states. Assuming that the power of the world, i.e., the total power of all states in the world, always equals 100%, and states compete for the size of the share in this whole, we can compare the power of states even in very long periods of time. The fact that state competition for power is a zero-sum game has fundamental implications for the behavior of political individuals in the

international environment. Therefore, in the game of power and interests, apart from the geopolitical position of states in the distribution of power, one should also examine the system of interests and other important geopolitical conditions that strengthen or weaken this position (Sułek, 2001; 2004; 2013; 2020; Białoskórski i in., 2018; 2019).

The general scheme of the research methodology assumes the determination of the distribution of power in terms of the main indicators of power, i.e., economic power, military power, and geopolitical power of the VG states. These indicators are a key determinant of their geopolitical impact on the distribution of power and thus determine their ability to achieve the best power position in this regional structure.

To determine the distribution of power of the VG states, a synthetic powermetric¹ model is used to measure the power, developed by the Polish researcher Mirosław Sułek (the so-called 'Sułek model'). This model allows to calculate the geopolitical power of the state on the basis of the economic and military power (main indicators) and the derivative values: militarization (economic, GDP, demographic), efficiency (economic and military) and power density (economic and military). The economic (general) power consists of economic outcomes (gross domestic product), demographic factors (population), and spatial factors (territory area)². Military power consists of military and economic factors (military expenditure, which is part of GDP), demographic and military factors (number of active duty soldiers), and spatial factors (territory area). Geopolitical power is calculated as the arithmetic mean of economic power and double military power (to indicate the significance of the military factor in shaping the current distribution of power). The theoretical assumptions of this model have been developed by M. Sułek from 2001 (Sułek, 2001; 2013; 2020a; Białoskórski et al., 2019).

The presented methodology has its sources in the theory of international relations and geopolitics; it also draws from the achievements of cybernetics and praxeology. The international

¹ Powermetrics is an applied science dealing with the measurement, estimation and evaluation of the power of communities and states, as well as modeling, simulating and forecasting relations between them in the global, regional and local dimensions.

² Economic power may be understood broadly, or in its narrow sense. For example, in its narrow sense, it may be identified with GDP, while in broad terms, economic power is also determined by demographic and spatial factors. Therefore, it may as well be referred to as general power. In this research we adopt the broad meaning of economic power, so the notions of economic power and general power are treated synonymously.

distribution of power as a research subject is presented in a quantified way. Its main content is the measurement of the power of states and the size of their derivatives. The formula used is based on dimensional analysis, which has been neglected in previous approaches, and is based only on constant factors and is necessary for the completeness of the description (Sułek, 2013; Höhn, 2011). Relations between political units are relations between people and have the character of cooperation or struggle. For this reason, some people are engaged in peacetime-oriented production and service activities and some are engaged in war-oriented activities. It assumes that, in the case of economic power, the expression of organizational and production skills or the ability to take collective action is the gross domestic product (GDP), and in the case of military power, military expenditure (MEX). Additionally, the population or the number of soldiers in active duty service and the area of state are taken into account to obtain the military power. Geopolitical power is the product of economic power and military power. Note that while population (L) is a quantitative indicator, the size of GDP (more precisely GDP per capita) is a qualitative indicator of human resources. This reasoning is summarized by the main formula.

The main formula expresses three types of power: economic (general), military, and geopolitical (Table 1). All collected data are divided by the respective global values, and the resulting fractional values are entered into the formula. The result of the calculation is the power of states expressed as a fraction or percent, taking the size of the world's power to be 100%. All types of power mentioned certainly share the same dimension, but they all differ in their nature. Economic (general) power reflects the distribution of power between states (political units), which results from the long process of historical development, and it cannot be increased by means of political decisions (however, it can be decreased). It should be noted that economic power is the least dependent on political decisions, while military power (MP) and indirectly geopolitical power (GP) are more sensitive, more sensitive, and dependent on political decisions in the short term. In this sense, it is objective by its nature. On the other hand, military power is subjective by nature as it is largely dependent on political decisions. In turn, geopolitical power places somewhere in between, although political decisions have a big impact on its value. It is essential to be aware of these differences when assessing international relations in terms of power relations. In the long run, it is an economic (general) power that is of decisive importance, which is why it is the main subject

of rivalry between states. In the short run, especially in a situation of an armed conflict, priority is given to military power and, to a lesser extent, to geopolitical power.

Table 1. The main formula of the Sułek model of power

Economic power	Geopolitical power
$EP = (GDP)^{0.652} \times L^{0.217} \times a^{0.109}$ <p>Symbols: EP – economic (general) power GDP – gross domestic product L – population a – territory (area)</p>	$GP = \frac{EP + (2 \times MP)}{3}$ <p>Symbols: GP – geopolitical power EP – economic power MP – military power</p>
<th style="background-color: #d3d3d3;">Military power</th>	
$MP = (MEX)^{0.652} \times S^{0.217} \times a^{0.109}$ <p>Symbols: MP – military power MEX – military expenditures S – active soldiers a – territory (area)</p>	

Source: Sułek (2020a); Białoskórski (2021).

Three types of militarization are distinguished: economic (general) militarization, militarization of GDP, and demographic militarization. Militarization indices are non-dimensional values. The economic (general) militarization index is expressed as a ratio of military power to economic (general) power, therefore:

$$m_e = \frac{MP}{EP}$$

It can also be interpreted as a mobilization index, which represents the amount of resources allocated (mobilized) for military (defence) purposes, and as a defence readiness index. It is a quotient of two indices, as illustrated by the following formula:

$$m_e = \frac{MEX^{0.652} \times S^{0.217} \times a^{0.109}}{GDP^{0.652} \times L^{0.217} \times a^{0.109}}$$

Once simplified, the formula takes the following form:

$$m_e = \left(\frac{MEX^{0.652}}{GDP^{0.652}} \right) \times \left(\frac{S^{0.217}}{L^{0.217}} \right)$$

The economic (general) militarization index is a product of two partial indices. The first index (m_{GDP}) expresses the militarization of GDP, while the other index (m_d) expresses the demographic militarization, as shown by the formulas as:

$$m_{GDP} = \frac{MEX^{0.652}}{GDP^{0.652}}$$

$$m_d = \frac{S^{0.217}}{L^{0.217}}$$

$$m_e = m_{GDP} \times m_d$$

The above indicators are an essential means to describe defence policies (military strategies) of different states. As many as three possible model situations are possible. First, the position of a state determined by all three types of militarization is similar (distribution position). However, it should be noted that this can be achieved at various levels of militarization, both high and low. Second, the position resulting from the militarization of GDP is evidently higher than the one resulting from the demographic militarization (imbalanced position). Third, the position resulting from demographic militarization is clearly higher than the position resulting from the militarization of GDP (imbalanced position). The high level of militarization of GDP in relation to demographic militarization is indicative of a state which maintains small-sized and typically professional, well-armed and well-equipped forces. In the opposite case, a large army is maintained, which is usually made up of conscripts who are poorly armed and poorly equipped (Białoskórski i in., 2019, p. 25).

There are two performance indicators, economic and military. The economic performance indicator takes the following form (Białoskórski i in., 2018, p. 147-160):

$$P_e = \frac{GDP^{0.652}}{L^{0.217} \times a^{0.217}}$$

This indicator can be interpreted as a general indicator of the organization of society, a broadly understood efficiency of operation, as it integrates economic, demographic, and space-time factors. This is undoubtedly one of the forms of social productivity. Specific conductivity is the physical analog of mobility. This measure is strongly correlated with the amount of GDP per capita; therefore, the richest states are among the top states with the highest index. It should also be noted that the size of the state has a certain positive impact on the size of the economic performance indicator. For example, when one state accounts for 1% of the world's gross product, the population and land area will have less mobility than a state with 10% of the respective size.

The military performance indicator is the product of the economic performance indicator and the economic militarization indicator:

$$P_m = P_e \times m_e$$

Military performance shows the level of defensive organization of the society, determined mainly by the level of economic development and the degree of harmonization of power factors in time and space. Hence, for example, weakly militarized Japan is at the forefront of states with the highest defense mobility, despite a low militarization indicator. Due to the fact that the militarization indicator is a dimensionless value, the physical analogue of the military mobility indicator also has specific conductivity. The order of states in terms of economic and military performance can vary greatly, as it is the product of two quantities. While economic performance in the short term is rigid (not susceptible to the actions of state authorities), economic militarization is the opposite – In the short term it can be significantly changed (by increasing the rate of military expanse and / or by increasing demographic militarization).

Analogously to the performance indicators, there are two density power indicators, the economic power density and the military power density.

The economic power density indicator takes the following form:

$$d_e = \frac{GDP^{0.652} \times L^{0.217}}{a^{0.217}}$$

It expresses the size of economic and demographic factors per unit of time and space. The ranking of states according to this criterion is

different from that for performance. Due to the fact that the population goes to the numerator, it has a positive effect on the size of the density indicator.

The military power density indicator is the product of two quantities, the economic density indicator and the economic militarization indicator:

$$d_m = d_e \times m_e$$

Regional power distribution in the VG states according to the formal model

This section answers the first research problem: *what is the structure of the distribution of power in VG?* This problem was solved with the main formula of the powermetric measurement of power. Data analysis takes into account the values of power and the position of states in the regional and global ranking of power. The power and position of the state are closely related. We can distinguish several types of state position in the ranking of power, that is, the nominal position and the real position, where the nominal position results from the calculated power or the position of the state in the structure of international organizations (eg in the UN Security Council) and the real position is measured by the influence value on the situation in the international system (Sułek, 2020b, p. 8–12). In this study, the research results refer to the nominal position (Table 2). It is clear that the distribution of power (in all categories of power) of the VG states is dominated by Poland. Poland is at the top of the regional power ranking ahead of the Czech Republic, Hungary and the Slovak Republic. Poland's percentage share in the total regional power of the VG structure is greater than 50% (EP=55%; MP=62%; GP=59%). It is also mapped in the highest positions of Poland in the global ranking of the power.

Table 2. Distribution of power in VG states in 2019 (world=100%)

	Economic Power (EP)	VGrank/world rank	Military Power (MP)	VG rank/world rank	Geopolitical Power (GP)	VG rank/world rank
Poland	0.629	1/23	0.650	1/24	0.643	1/24
Czech Rep.	0.232	2/52	0.161	2/58	0.185	2/55
Hungary	0.176	3/62	0.132	3/65	0.147	3/64
Slovak Rep.	0.110	4/73	0.105	4/69	0.106	4/73
VG total	1.147		1.048		1.081	

Source: own elaboration.

Poland also occupies the position of the economic, military, and geopolitical pole of this VG regional (unipolar) structure. As a polarity criterion to recognize every (global, regional, and local) international system as unipolar, bipolar, or multipolar, I have adopted an algorithm for comparing the ratios of the largest powers of states in the ranking: first with the second ($P1/P2$), first with the third ($P1/P3$) etc. If $P1 > 2 \times P2$ - the system is unipolar with one pole - P1. If $P1 \leq 2 \times P2$ - the system is bipolar with two poles, P1 and P2. If $P1 > 2 \times P3$ - the bipolar system is established. If $P1 \leq 2 \times P3$ - the system is multipolar with three poles - P1, P2, and P3. The next poles of the system can be recognized in the same way. According to this model of determining the pole of power structure, it is clear:

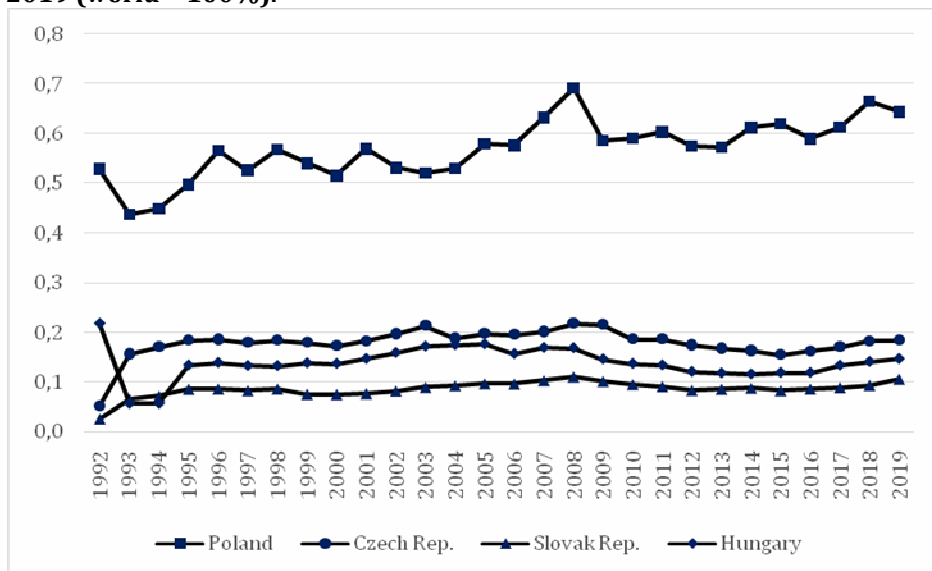
$EP1_{POLAND} = 0.629\% / EP2_{CZ.REP} = 0.232\% = 2.711 (>2.0)$ - unipolar system is complete,

$MP1_{POLAND} = 0.650\% / EP2_{CZ.REP} = 0.161\% = 4.037 (>2.0)$ - unipolar system is complete,

$GP1_{POLAND} = 0.643\% / GP2_{CZ.REP} = 0.185\% = 3.476 (>2.0)$ - unipolar system is complete.

The growth of the power dynamics of Poland compared to the power of the other VG states is also the highest (Fig. 2).

Fig. 2. Regional distribution of geopolitical power (GP) of the VG states in 1992-2019 (world = 100%).



Source: own elaboration.

This unipolar position of Poland according to economic, military, and geopolitical power in the VG structure follows directly from its highest values of all data components of the main formula of power compared to other indicators of the state of the VG (Table 3).

Table 3. Data components of the main formula of the VG states' power in 2019 (world = 100%).

VG state	GDP	VG rank/ world rank	L	VG rank/ world rank	MEX	VG rank/ world rank	S	VG rank/ world rank	a	VG rank/ world rank
Poland	0.675	1/21	0.495	1/38	0.657	1/20	0.625	1/41	0.240	1/69
Czech Rep.	0.281	2/48	0.139	2/87	0.170	2/51	0.116	3/92	0.061	3/114
Slovak Rep.	0.120	4/62	0.071	4/117	0.108	4/60	0.081	4/102	0.038	4/128
Hungary	0.183	3/57	0.127	3/93	0.115	3/57	0.141	2/81	0.071	2/109

Source: own elaboration.

The impact of derivative factors on the regional distribution of power in VG states

Poland (1. rank) and the Slovak Republic (2. rank) have achieved the highest economic militarization ratio (Table 4). It means their higher level of mobilization of state resources for defense purposes compared to Hungary (3. rank) and the Czech Republic (4. rank).

Table 4. The militarization distribution of VG states in 2019 (world=100%)

VG state	Economic militarization (me)	VG rank/world rank	GDP Militarization (mGDP)	VG rank/world rank	Demographics Militarization (md)	VG rank/world rank
Poland	1.034	1/42	0.983	1/46	1.052	1/71
Slovak Rep.	0.957	2/50	0.932	2/52	1.028	2/79
Hungary	0.754	3/74	0.738	3/86	1.022	3/81
Czech Rep.	0.692	4/89	0.720	4/91	0.961	4/100

Source: own elaboration.

For Poland and the Slovak Republic, the economic militarization ratios were achieved by the balanced distribution ratios of GDP militarization and demographics militarization with as light advantage over the last. Hungary and Czech Rep. have a less balanced distribution ratio of these two indicators. The militarization of GDP shows the significance of military expenditure (MEX) and demographic militarization, the level of professionalization of the armed forces in the

ratio of economic militarization. There are four situations that affect the nature of the armed forces of the state (Table 5).

Table 5. The Impact of GDP Militarization and Demographic Militarization Ratio on the Army Nature of the Armed Forces

	High m_d	Low m_d
High m_{GDP}	High level of professional army balance (probably recruitment armed forces)	High level of professionalism in the army (probably a professional armed forces)
Low m_{GDP}	Low level of professionalism in the army (probably an recruitment armed forces)	Low level of professional army balance (probably recruitment armed forces)

Source: framework in (Kiczma & Sułek, 2020, s. 30).

The armed forces of all VG states are professional. The level of professionalism of the Polish and Slovak armed forces is higher than that of the Czech and Hungarian. This is also reflected in the positions of the VG states in the global militarization ranking (Table 4). It means that this militarization index strongly strengthens the position of Poland and, but only slightly, strengthens the position of the Slovak Rep. in the regional distribution of power of the VG states.

Economic performance (P_e) is an extended indicator of social efficiency expressed as the amount of GDP per unit of time, space, and human units (GDP per capita). An increase in economic performance means an increase in the operational mobility of the system. Military performance is a militarized economic performance. There may be a high value of P_e and a low value of P_m with a low value of the economic militarization index (m_e). Therefore, the military performance index can be increased (controlled) by the higher value of the economic militarization index. The Czech Rep. has noted the highest rank of P_e (1. rank) before Poland (2. rank) with a small value difference (0.014), due to the higher value of GDP per capita (23102 current USD) in relation to Poland (15595 current USD). However, this fact does not affect the value of the Czech military performance (3. rank), where Poland is the leader due to the higher value of the economic militarization index (Table 6).

The economic power density (d_e) is the consistency of the economic environment. High GDP and high population values mean a high economic (general) density index. GDP may be relatively low (poor countries), but a large population index means also a significant economic power density value. A high population index reduces economic performance and increases the density of economic power. The economic power density is also determined by an area (territory)

index. An increase in the area (territory) index reduces the density of economic power.

Table 6. The performance and power density distribution of the VG states in 2019 (world=100%)

VG state	Economic performance (Pe)	VG rank/world rank	Military performance (Pm)	VG rank/world rank	Economic power density (de)	VG rank/world rank	Military power density (dm)	VG rank/world rank
Poland	0.515	2/31	0.532	1/25	0.051	1/24	0.053	1/20
Slovak Rep.	0.399	4/42	0.382	2/36	0.017	4/64	0.016	4/61
Czech Rep.	0.529	1/30	0.366	3/40	0.030	2/42	0.021	2/51
Hungary	0.399	3/41	0.301	4/54	0.022	3/54	0.017	3/60

Source: own elaboration.

The military power density (d_m) is the consistence of the military environment. This index strongly depends on the economic militarization and the value of the area (territorial). The increase in the operational area strongly disperses the military capabilities (defensive and offensive). For example, a state with a high military power density (e.g. the Third German Reich) during the military invasion on the territory of a state with a lower d_m index (e.g. the Soviet Union) can lose its d_m as a result of progressive territorial expansion (additionally on two fronts) and d_m of the victim grows as a result of its territorial concentration.

This ranking strengthens Poland's position (1. rank) as a regional leader of VG states with the highest economic density and military power density values, before Czech Rep. (2. rank), Hungary (3. rank), and Slovak Rep. (4. rank).

Conclusions

The results of the research determined the regional distribution of the power of the VG states. According to the powermetric methodology based on the synthetic formal model of measuring the state power and its derivative indicators, which strengthen or weaken the position of the state in the system, the regional distribution of power of VG states has a unipolar structure dominated by Poland. This unipolar position of Poland according to the economic power, military power, and geopolitical power in the VG structure follows directly from its highest values of all data components of the main formula of power compared to other indicators of the state of the VG. Poland is at the top of the regional

power ranking ahead of the Czech Republic, Hungary and the Slovak Republic. Poland's percentage share in the total regional power of the VG structure is greater than 50% (EP=55%; MP=62%; GP=59%). It is also mapped in the highest positions of Poland in the global ranking of the power and confirmed by the derivative factor distribution, i.e., the militarization, the performance, and the power density. Assessment of the distribution of power is the first step toward a comprehensive evaluation of the game of power and the game of interest in every international system.

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Rozkład potęgi w państwach Grupy Wyszehradzkiej. Podejście potęgometryczne

W artykule przedstawiono wyniki badań nad rozkładem sił w czterech państwach Grupy Wyszehradzkiej (Polska, Węgry, Czechy i Słowacja) w perspektywie podejścia powermetrycznego, według syntetycznego formalnego modelu pomiaru siły ekonomicznej, siły militarnej i siły geopolitycznej państwa oraz jego wskaźników pochodnych, wzmacniających lub osłabiających pozycję państwa w systemie. Model ten został opracowany przez polskiego badacza Mirosława Sułkę (Uniwersytet Warszawski). Regionalny rozkład wszystkich trzech kategorii potęgi państw VG ma strukturę jednobiegunową, w której dominuje Polska z ponad pięćdziesięcioprocentowym udziałem w całkowitej potędze regionalnej struktury VG. Ocena rozkładu sił jest pierwszym krokiem do kompleksowej oceny gry o władzę i gry interesów w każdym systemie międzynarodowym.

Słowa kluczowe: Grupa Wyszehradzka, potęgotmetria, potęga ekonomiczna, potęga militarna, potęga geopolityczna, militaryzacja.