


ASSESSING THE PROSPECTIVE IMPACT OF BREXIT ON THE GLOBAL ARCHITECTURE OF POWER. A MULTIDIMENSIONAL APPROACH FOCUSING ON UK AND EU

Tudor-Mugurel AURSULESEI ¹, Liviu-George MAHA ², Stefan-Catalin TOPLICEANU ³,
Elena-Daniela VIORICA ⁴

^{1,2,3}Department of Economics and International Relations, Faculty of Economics and Business Administration, Alexandru Ioan Cuza University of Iasi, Iasi, Romania

⁴Department of Accounting, Business Information Systems and Statistics, Faculty of Economics and Business Administration, Alexandru Ioan Cuza University of Iasi, Iasi, Romania

Article History:

- received 12 May 2023
- accepted 19 February 2024

Abstract. Brexit has undeniably had effects on power relations in the world economy and beyond. This article aims to measure the dimensions of power for the European Union, the United States and the BRICS countries and to provide a case study about the prospective impact of Brexit on the EU's and the UK's positions within the global architecture of power. In this regard, the paper proposes a new method of measurement of the world power by using six dimensions of power, using data before the Brexit procedures started. The highlights of the empirical findings are that the exclusion of the UK has strengthened EU's position only for the economic dimension of power, while for the UK, the most dominant repositioning within the power architecture due to the Brexit is recorded for the political & governance. The findings can contribute to raising awareness among policy-makers, companies, institutions and the population, both at European and at national level, about populist tendencies and attitudes towards potential separations of some member countries from the European community and their consequences for the European development from multiple perspectives.

Keywords: international order, world power, Brexit impact scenario, multidimensional index, Euclidian distance, economic powers, BRICS countries.

JEL Classification: F02, F50, O57.

✉ Corresponding author. E-mail: tstefan.catalin@yahoo.com

1. Introduction

Although it is a complex concept, leading to multiple interpretations, most authors consider power as the ability of an economic or political actor to exert a significant influence on the world economy, using different tools, even when there are certain oppositions (Dahl, 1957; Pausenberger, 1983; Morgenthau & Thompson, 2005; Nye, 2011). Starting from this influence, power is divided into several components: physical (endowment with natural resources), economic, military, political and moral-cultural, of which the economic one is the most used in contemporary power relations (Kebabdjian, 1994).

Many events influence the natural course of the world economy, changing the power relations between states. Historical events like the creation of the European Union, the German reunification, or the disintegration of the Soviet Union at the end of the twentieth century led to the shaping of the world system. At the same time, various regional and military conflicts, coupled with an increase in terrorist acts, oil crises and economic shocks have determined changes in the power relations, while new powers and emergent economies have asserted themselves in the world economy (Krauthammer, 2002; Haass, 2008; Freddy & Thomas, 2023). Thus, most scholars believe that, at the beginning of the 21st century, the world economy has a multipolar structure, in which traditional powers as the United States and the European Union are mixed with emerging powers as BRICS – Brazil, Russia, India, China and South Africa (Khanna, 2008; Gelb, 2009; Nenci & Montalbano, 2011; Nye, 2011; Dimitrijević, 2023). Considering that historical events, crises, economic shocks, pandemics, and emerging economies highly influence the power relations, also Brexit has the potential to influence the global power architecture, especially the positions of the European Union and of the United Kingdom.

Following this approach, the aim of this paper is two-folded: to measure the dimensions of power for the considered global actors, and to provide a case study evaluating how Brexit would have impacted, for each dimension, the EU's and the UK's positions within the configuration of these great powers, by analyzing UK and EU27 as separate economies. To this end, we considered the period 2013–2018 to capture a relative stability from the perspective of the EU enlargement process. The year 2013 is a reference point because Croatia became a member of the EU, being the last country to do so. On the other hand, 2018 is a key moment for the Brexit process, before the UK's procedures for leaving EU started. Even though the UK notified the EU of its withdrawal in 2017, the exit procedures actually started in 2019, after almost two years of negotiations (Oberhofer & Pfaffermayr, 2021; Bailey et al., 2023). Thus, we considered the period 2013–2018 so that the results are not biased by the responses from the individuals, companies and international institutions, engaged by the Brexit procedures. At the same time, we considered this period so that the effects generated by the COVID-19 pandemic do not influence the results.

This analysis is motivated by the multitude of approaches to measuring power levels in a multipolar world economy, which has led to an interest in a new approach. The paper offers a new methodology regarding the measurement of the world power by including the multitude of defining elements in six dimensions, namely physical, economic, politics & governance, social & cultural, technological and military. By incorporating both tangible and intangible resources of power, this paper aims to complement the various existing approaches as well as the literature with a new measurement perspective.

At the same time, in the context of the Brexit debate and negotiations for the UK's exit from the EU, there have been no scientifically based estimates or rigorous calculations of its impact on the UK and EU's positions in the global power architecture. Many academic studies are concerned with the impact of Brexit on the EU, the UK or for both in economic, social or political terms, offering predictions or various scenarios about the effects generated by this event. Only a small number of studies provide the necessary statistically tool to quantify the effects of Brexit on power relations in the world economy, most studies being rather descriptive or narrative on this topic. In this regard, this paper responds to the literature by providing a rigorous tool for estimating these effects. Thus, this paper contributes to the existent literature with three novelty elements:

1. The topic of the paper: a six-dimensions approach to measuring the position of a country/region in the global architecture of world's powers and the subsequent

comparison analysis of the reality versus the simulation in which Brexit would not have happened;

2. A measurement instrument that captures both tangible and intangible variables on the six dimensions relevant for assessing the countries' positions in the global architecture of power;
3. Developing an indicator that uses Euclidean distances to measure the relative change in the power level for the EU, compared to the other world powers, when excluding UK from EU compared to when included.

The paper has three main parts, each of them divided in subsections. The first section includes the literature review and has two parts, including the multiple approaches to measuring power and the predictions of the multidimensional effects generated by Brexit. The second section presents the materials and methods used to measure the level of power for the considered global actors, as well as the impact of Brexit on the positions of the UK and the EU in the global power architecture. The third section provides the results of the analysis and has four subsections. On the one hand, a subsection presents the multidimensional analysis of power for each global actor from the sample. The second subsection offers a deepened view on the composing indicators of each dimension of power. On the other hand, the analysis reflects the relative change in the EU's level of power compared to other actors. The final subsection provides discussions based on results. Finally, the paper presents conclusions and possible implications.

2. Literature review

2.1. The complex process of measuring power

Measuring the power level of states has become more complex and more difficult to achieve given the intensification of interdependencies between economies, as well as the diversification of the ways of exercising the influences at global level and of the vulnerabilities faced by states. Each country has specific elements through which it defines its power level. The multidimensional character of power derives from the fact that a country can have important performances for some dimensions and difficulties in others.

There are a multitude of ways to quantify the power level for states, using both tangible and intangible elements. In this regard, economic, natural and military resources, territory, size of the population, political stability, and industrial and technological capacities, as well as national morale, the quality of government, diplomacy, cultural values, and the level of military training determine power (Tellis et al., 2000; Mearsheimer, 2001; Morgenthau & Thompson, 2005; Waltz, 2010). Given the multiple views regarding the elements used to quantify power and the large number of these determinants, many authors have resorted to grouping them into different dimensions of power.

A first classification has been made in general groups of factors, such as natural and social determinants, according to their origin and applicability (Jablonsky, 2008). The natural components of power refer to natural resources, geographical characteristics, and demographic elements. On the other hand, social factors include economic components, military aspects, political attributes, informational resources, and psychological national skills. This paper proposes a different separation of social factors compared to Jablonsky (2008), in the sense that economic, social, political and military factors are part of distinct categories, capable of incorporating more elements of power.

Another classification considers the temporary action of the determinants on power. In the short run, the power is given by the quality of government, political management, the potential to produce weapons, the support given to the allies, leadership, and military force. In the long run, the determinants of power are the size of GDP, population, territory, geographical features, natural resources, political culture, education, cultural attractiveness, promoted values, and technological and scientific knowledge (Goldstein & Pevehouse, 2014). In this case, the elements of power are rather treated in a more general spectrum and are not even grouped into distinct categories. Therefore, this paper suggests that a grouping of power elements into separate dimensions offers the possibility of analyzing a larger number of factors simultaneously, as well as to identify the character of the sources of power and to compare the different existing dimensions.

Glassner and Fahrer (2004) realized a further classification of the elements of power in several groups as follows: economic, geographical, governance, population, communications and transport, international relations, and military. Although these authors mentioned new elements of power, their study is in line with other studies in the literature on this topic by offering a rather narrative or descriptive approach than a quantitative one.

These considerations suggest how important it is for the measurement of the power level to include a multitude of defining elements. This is possible by using composite indicators that encompass both tangible and intangible factors. The previous studies presented do not consider the use of the mentioned indicators for measuring power in empirical studies, but rather these authors are concerned with mentioning and describing the determinants of power and, at best, grouping them by different categories. The overall measurement of national power should not be so important, but the focus should be on quantifying the distribution of power on specific components (Baldwin, 2013). To this end, this study improves the literature by offering a new approach of grouping the elements of power into distinct dimensions and sub-dimensions, by including more power factors in the analysis and by providing a statistical tool for the measurement of the power levels.

2.2. Predicting the multiple effects of Brexit

There were many academic and political debates regarding Brexit, leading to numerous predictions and scenarios about the resulting effects for several dimensions. However, most analyses in the literature approach the effects of Brexit from one or at most two perspectives, as shown in Table 1.

Table 1. Types of approaches regarding the Brexit effects (source: own processing)

Author	Geographical and human resources	Economic	Political	Social and cultural	Military and international influence
Irwin (2015)	X	X	X	X	X
Begg and Mushovel (2016)		X			
Bollen et al. (2016)		X			
Bond et al. (2016)	X		X		X
Dhingra et al. (2016)		X			
Rojas-Romagosa (2016)		X			

End of Table 1

Author	Geographical and human resources	Economic	Political	Social and cultural	Military and international influence
Emerson et al. (2017)	X	X	X		
Felbermayr et al. (2017)		X			
Lawless and Morgenroth (2019)		X			
Marginean et al. (2020)		X			
Oberhofer and Pfaffermayr (2021)		X			
Prikhodko (2022)					X
Vandenbussche et al. (2022)	X	X			
Bailey et al. (2023)		X			
Highman et al. (2023)				X	
Oliver (2023)					X
Marini (2024)				X	

Most researchers have studied the economic effects of Brexit, while some of them have linked them with other dimensions. Irwin (2015) succeeds in providing a comprehensive analysis of Brexit effects, but his approach combines several descriptive parts with his own assessments and interpretations of the statistical evaluations provided by various sources. Compared to the literature, this paper offers a multi-sided approach to the impact of Brexit, somewhat in line with the Irwin's comprehensive analysis, but delivering a statistical tool to assess this impact on the EU's and the UK's global positions from multiple dimensions.

This paper considers the geographical elements, infrastructure, natural and human resources as components of physical power, as Brexit influences all of them. In the literature, some researchers have analyzed the effects of Brexit in terms of human resources, but these elements are linked with the economic approach (Irwin, 2015; Emerson et al. 2017; Vandenbussche et al., 2022). Other researchers are interested in natural resources, but in terms of energy and climate policy (Kuzemko et al., 2022; Pollitt, 2022). In addition, the impact of Brexit on infrastructure has started to attract the attention of scientists, but from a trade perspective (Morchid & O'Mahony, 2019; Ke et al., 2022).

The economic effects of Brexit are the most interesting for authors, while studies have shown that both the EU and the UK will be affected, but mostly the British economy (Begg & Mushovel, 2016; Dhingra et al., 2016; Rojas-Romagosa, 2016; Felbermayr et al., 2017; Lawless & Morgenroth, 2019; Vandenbussche et al., 2022; Buigut & Kapar, 2023). These studies focus only on economic effects, estimating the impact of Brexit on certain variables such as GDP, trade, income, productivity, wages, and foreign investments. Marginean et al. (2020) have provided a systematic review of the most important economic effects of Brexit, grouping them in four directions: overall economic effects, trade, migration, and financial aspects. Nevertheless, their qualitative approach is limited on three aspects (time, keywords and the selected databases), while the selection of the existing literature may fall under subjectivity.

Most of these studies provided projections on the effects of Brexit in the context of the 2016 referendum or immediately after it and before the start of negotiations. In this case,

there was uncertainty about the exit procedures, as well as the state of relations between the EU and the UK. In this regard, authors preferred to offer predictions about the effects of Brexit in two broad scenarios, both optimistic and pessimistic (Dhingra et al. 2016; Rojas–Romagosa, 2016) or both soft and hard Brexit (Bollen et al., 2016; Felbermayr et al., 2017). Therefore, forecasts are different from one author to another and vary in extremely wide ranges, depending on the variables monitored and the prefigured scenarios. Emerson et al. (2017) have summarized various studies regarding the long impact of Brexit by 2030. On average, the estimations suggested a GDP reduction between 0.11% and 0.52% considering the optimistic and pessimistic scenarios. This means losses between 13.3 and 63 billion euro for the EU27. Instead, the UK might suffer a GDP reduction between 1.3% and 4.2%, meaning losses ranging from 33.8 billion euro to 109 billion euro.

Although their approaches are similar to those in the literature, being descriptive rather than providing quantitative tools to measure the impact of Brexit, some authors extended the analysis of Brexit effects beyond the economic perspective (Table 1). Emerson et al. (2017) considered that Brexit caused a big politico–economic shock for the EU system, capable to affect the EU foundations and to encourage the populist movements in Europe. In a more optimistic scenario, Brexit can stimulate the EU to become a more strength economic and political structure. In addition, the EU loses a member state with high political weight in negotiations with external partners, especially on trade policy. As regarding the UK, Brexit will reduce the negotiating tools it had within the EU in trade agreements with major economies (Irwin, 2015; Bollen et al., 2016). Irwin (2015) and Highman et al. (2023) have explored the social, cultural and technological effects of Brexit, although their studies are descriptive or resort to interpretations of statistical data from different sources. They suggested that Brexit might affect the collaboration in education between both parties, the access to UK universities and the student mobility programs. As regarding technological aspects, Brexit might erode the industrial competition policy and weaken the collaboration in education and research. At the same time, the EU is losing one of its biggest sources of development funding, while the UK is losing access to European structural funds needed to modernize UK higher education institutions.

In terms of military and international influence, the existing approaches are rather descriptive or narrative than quantitative. Having strong hard and soft power, the UK is more able to take actions externally and in international organizations. From this perspective, the EU is losing one of the top European powers, with great externally influence and high political weight in negotiations, especially in the United Nations Security Council where the UK is a permanent member. Moreover, the EU is losing one of the biggest military spender and one of the highest rated countries in international surveys regarding soft power (Irwin, 2015; Prikhodko, 2022). Brexit might affect the European worldwide influence and its competition with other economic powers, while the UK has the chance to regain its independence and international influence and to reaffirm as a great world power (Bond et al., 2016). On the other hand, this situation may be to the advantage of the EU since many initiatives for an own European army or for making the EU an independent military power were blocked by the UK and its common views shared with the United States. After Brexit, the UK can no longer intervene in European affairs, while the EU has the opportunity to become more independent from American military power. Moreover, Brexit restrains the UK's ability to mediate between the EU and the United States, having implications for the European balance of power and for the transatlantic relationship (Irwin, 2015; Bond et al., 2016; Prikhodko, 2022).

In general, when it comes to forecasting the multiple effects of Brexit, the approach of specialists is economic and the existing literature only uses quantitative tools to predict

economic effects. Studying the effects of Brexit on other dimensions considers descriptive and narrative approaches or assumptions and interpretations of different statistical data. Under these considerations, this paper provides a multidimensional approach to measure the impact of Brexit and offers a statistical tool to assess this effect within the global architecture of power, in particular for the EU and the UK.

3. Data and methodology

The used methodology proposes a new approach regarding the measurement of the world power, using six dimensions of power: physical, economic, politics & governance, social & cultural, technological and military. For each dimension, at least two significant sub-dimensions are considered, each being measured by a set of relevant indicators (Table 2). The data sources are The World Bank, World Development Indicators (n.d.-a), The World Bank, Worldwide Governance Indicators (n.d.-b), The World Economic Forum (Schwab, 2017), Central Intelligence Agency (n.d.), The Heritage Foundation (Miller et al., 2019), Organization for Economic Co-operation and Development (OECD, n.d.), The United Nations Development Programme (n.d.), Enerdata (2020), Transparency International (2019), Cornell University, The Business School for the World (INSEAD) and The World Intellectual Property Organization (WIPO) (2018, 2017, 2016, 2015, 2014, 2013). The period under analysis is 2013–2018, using data before the Brexit procedures started to evaluate how Brexit would have affected the EU's and the UK's positions within the global configuration of great powers.

Table 2. The six dimensions of power (source: own processing)

Dimension	Sub-dimension	Variables
Physical power	Geographical elements	Surface area (million km ²) Coastline (thousands km) Land boundaries (thousands km)
	Natural resources	Arable land (million hectares) Forest area (million km ²) Water area (million km ²) Crude oil production (Gt) Natural gas production (Tcm) Total natural resources rents (trillion \$)
	Demography	Population, total (billion people) Population growth (annual) (%) Population ages 0–14 (billion people) Active population (ages 15–64) (billion people)
	Infrastructure	Quality of overall infrastructure (1–7) Total energy production (Gt) Quality of road network (1–7) Quality of railroad network (1–7) Air transport, passengers carried (billion people) Quality of port infrastructure (1–7)
Economic power	Economic output	GDP, PPP (trillion \$) GDP per capita, PPP (thousands \$) GNI (trillion \$) GNI per capita, PPP (thousands \$) Adjusted net national income (trillion \$) Adjusted net national income per capita (thousands \$)

Continued Table 2

Dimension	Sub-dimension	Variables
Economic power	Economic dynamics	GDP growth (annual) (%) GDP per capita, annual growth (%) GNI growth (annual) (%) GNI per capita, annual growth (%)
	Business environment	The Global Competitiveness Index (1–7) Profit tax (% of commercial profits) Total tax and contribution rate (% of profit) Time required to start a business (days) Index of economic freedom (0–100) Property right (1–7) Burden of customs procedure (1–7) Logistics performance (1–5)
	Investments	Gross capital formation (trillion \$) FDI, net inflows (trillion \$) FDI, stocks inward (trillion \$) FDI, stocks outward (trillion \$) Domestic credit to private sector (trillion \$) Listed domestic companies (thousands)
	Productivity	Agriculture, forestry, and fishing, value added (trillion \$) Industry (including construction), value added (trillion \$) Services, value added (trillion \$)
	Foreign trade	Exports of goods and services (trillion \$) Imports of goods and services (trillion \$) External balance on goods and services (trillion \$) Fuel exports (trillion \$) Fuel imports (trillion \$) External balance on trade fuel (trillion \$)
Politics & Governance power	Political environment	Rule of Law (0–100) Regulatory Quality (0–100) Voice and Accountability (0–100) Political Stability and Absence of Violence (0–100) Strength of legal rights index (0–12) Control of Corruption (0–100)
	Governance Performance	Government Effectiveness (0–100) Country capacity to attract talent (1–7) Country capacity to retain talent (1–7)
	Public perception	Public trust in politicians (1–7) Corruption Perceptions Index (0–100)
Social & Cultural power	Educational system	Adjusted savings: education expenditure (trillion \$) Quality of the education system (1–7) Mean years of schooling (years) Education index (1–7) Population with at least some secondary education (% ages 25 and older)
	Human development	Human Development Index (HDI) (0–1)
	Demographic aspects	Life expectancy at birth, total (years) Natural increase of population (1000 people) Mortality rate, infant (million live births) Age dependency ratio (% of working-age population)

End of Table 2

Dimension	Sub-dimension	Variables
Technological power	Research and Technological development	University/industry research collaboration (1–7) Gross expenditure on Research and Development (% GDP) Patent applications (million)
	Innovation	Global Innovation Index (0–100) Firm-level technology absorption (1–7) High-technology exports (trillion \$)
Military power	Military infrastructure and resources	Armed forces personnel (million people) Military expenditure (trillion \$)
	Arms trade	Arms exports (billion \$) Arms imports (billion \$) External balance on arms trade (billion \$)

The methodology follows several steps, in order to respond to the paper's objective:

Step One. For each of the six dimensions, we computed an aggregate indicator, applying the methodology of Nardo et al. (2008), which uses the Principal Components Analysis to determine the variables' weights. For each sub-dimension, we calculated the sub-indexes that were aggregated using equal weights. Prior calculating the indexes, we normalized all the variables using the min–max method.

Step Two. For a comparative analysis of the two situations (the sample of countries with EU28 and the scenario in which UK and EU27 are considered as separate economies), we calculated an index based on Euclidean distances between EU and each of the other countries. This step is necessary in order to explore the possibility of a shift in the EU's position when excluding UK compared to when included.

If there is a change in the position of the EU27 against a country, compared to the EU28's position against that country, the prospective impact of Brexit is easily revealed: if the position of the EU27 downgrades, there is a negative Brexit impact on the EU; otherwise, the impact is positive. If there is no shifting, we calculated an index based on Euclidean distances between the values of the indicator from in *Step One* in order to assess the direction and the intensity of the impact:

$$i_{EU,j} = \left(\frac{d_{EU27,j} - d_{EU28,j}}{d_{EU28,j}} \cdot 100 \right) \cdot (\pm 1), \quad (1)$$

where: $d_{EU27,j}$ – measures the Euclidean distance between EU27 and the country j ; $d_{EU28,j}$ – measures the Euclidean distance between EU28 and the country j ; ± 1 – an adjustment coefficient, taking the value +1 when the difference between the sub-dimension index for EU and for the country j is positive and –1 otherwise.

The positive values for the index will show that the EU's position against the country j has improved following Brexit. The negative values show that excluding the UK from the EU has widened the lag between the EU and the country j , to the detriment of the EU.

4. Results and discussions

4.1. The multidimensional analysis of the world powers

Figure 1 summarizes the visual representation of the aggregate index’s values for each of the six dimensions, for the two situations.

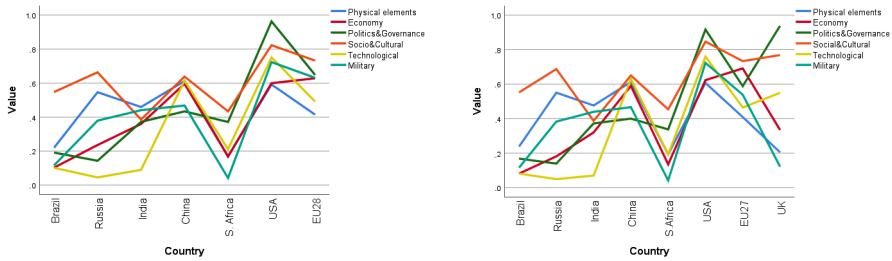


Figure 1. Dimensions’ indexes for EU28 situation and for EU27 & UK situation

For the economic dimension of power, the European index value increases, while for social & cultural still almost the same. In addition, for the other dimensions the European index values record decreases (Table 3).

Table 3. Index values for EU28 situation (A) and for EU27 and UK situation (B) (source: own processing)

Dimension	Index values								
	Brazil	Russia	India	China	S. Africa	USA	EU28	EU27	UK
Physical (A)	0.220	0.546	0.459	0.612	0.168	0.592	0.415	–	–
Physical (B)	0.237	0.551	0.476	0.612	0.193	0.607	–	0.409	0.204
Economics (A)	0.103	0.236	0.360	0.596	0.168	0.599	0.628	–	–
Economics (B)	0.081	0.181	0.320	0.590	0.135	0.623	–	0.691	0.335
Politics & Governance (A)	0.191	0.143	0.372	0.434	0.371	0.963	0.648	–	–
Politics & Governance (B)	0.168	0.139	0.372	0.400	0.337	0.917	–	0.589	0.938
Social & Cultural (A)	0.547	0.664	0.386	0.638	0.434	0.823	0.732	–	–
Social & Cultural (B)	0.552	0.687	0.387	0.650	0.454	0.847	–	0.733	0.769
Technological (A)	0.102	0.045	0.090	0.614	0.211	0.751	0.492	–	–
Technological (B)	0.081	0.049	0.069	0.630	0.193	0.760	–	0.464	0.550
Military (A)	0.116	0.379	0.441	0.468	0.042	0.723	0.631	–	–
Military (B)	0.115	0.383	0.439	0.466	0.041	0.724	–	0.539	0.122

For the physical component, Brexit has a negative impact only on the EU, while for other world powers the index values are increasing. The biggest increases are in the cases of South Africa and Brazil. At the same time, the EU28 has a better position only compared to Brazil and South Africa, while the other world powers have higher index values than the EU28. However, the position of the EU27 in relation to the other powers does not change. In other words, there is the same hierarchy, China, the United States, Russia and India occupying the first four places, followed by the EU in both situations (A) and (B). As regarding the UK, for situation (B), the British economy has a better position only compared to South Africa, having an index value twice as small as the EU27.

For the economic power dimension, the index values for the EU27 is higher than for EU28, showing an improvement due to the Brexit. At the same time, the values for the United States increase, while all index values for the BRICS countries show decreases, the biggest for Russia. In terms of economic hierarchy, both the EU28 and the EU27 have better positions compared to the other world powers for the economic power dimension. For situation (A), the EU28 is first, followed by the United States, China and India, while for situation (B), the first three places are the same, while the UK takes India's place.

The politics & governance dimension reveals decreases of index values for all world powers analyzed (the biggest for the US), while Brexit affects their positions within the architecture of power. The EU is losing a position in the ranking. For situation (A), the EU28's position is after the US, having an index value of almost 0.65, higher than the other world powers. For situation (B), due to the Brexit, the index value of EU27 is lower than EU28, positioning it after the UK and the US. At the same time, the US is losing its first place in detriment of the UK.

For social & cultural component, the EU28 and the EU27 have the almost same index values, while the index values of the other world powers are higher due Brexit, the biggest increases being recorded for the US and Russia. However, the position among world powers is changing. For situation (A), the EU28 is the second, after the US, while for situation (B), the UK is the second and the EU27 is down in the third place.

From a technological point of view, Brexit determines a decline in the position of the European economy, the EU27 having lower index value than the EU28. Only the index values of China, the US, and Russia increase, while the European values decrease by almost 0.3 points. Thus, for situation (A), the EU28 is the third world power, after the US and China, while for situation (B) the UK takes the third place and the EU27 is the fourth.

For the military component, the European index values decrease by almost 0.1 points, being the biggest decrease among the world powers. At the same time, China, India, and Brazil record decreases, but insignificant. Although the European index values decrease, due to the Brexit, both the EU28 and the EU27 are ahead of the other world powers, but have worse positions than the United States. As regarding the UK, for situation (B), the British economy has a better position only compared to Brazil and South Africa, having almost the same index value as Brazil.

Section 4.2 provides a more in-depth analysis of each power dimension and its sub-dimensions for a better understanding of the changes in index values for each global power.

4.2. In-depth analysis on the composing indicators of each dimension

For the two situations, Figure 2 presents the indexes for the six dimensions and their corresponding sub-dimensions.

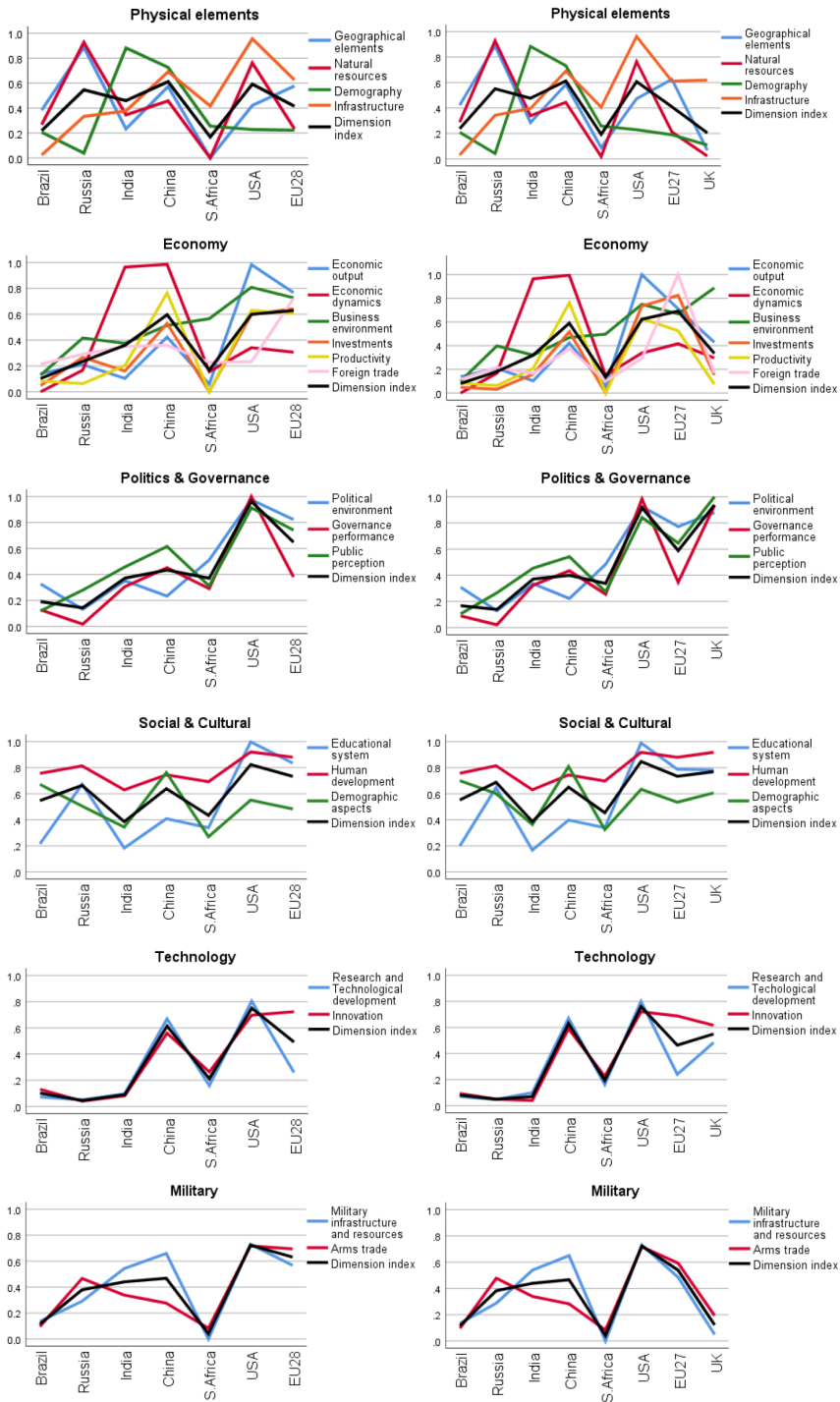


Figure 2. Dimensions and sub-dimensions of indexes

The EU's global position is deteriorating due to the lower score of some sub-dimensions, such as educational system, political environment, governance performance, public perception regarding political and governance aspects, innovation, and research and technological development.

As mentioned previously, although the index values of EU27 are lower than EU28 for the physical and military components, the EU's global position is the same. This happens because the increases in the scores for some sub-dimensions compensate the decreases from others. Analyzing the sub-dimensions for physical dimension, the EU27 has higher index values than EU28 regarding geographical elements (Table 4). For the other three sub-dimensions, Brexit affects the European index values, demography having the biggest decrease. On the other hand, the UK has a better position than the EU27 only on infrastructure, taking the third place due to Brexit in detriment of the EU28.

Table 4. Index values for sub-dimensions of physical component (source: own processing)

Sub-dimension	Index values for situation (A) and situation (B)								
	Brazil	Russia	India	China	S. Africa	USA	EU28	EU27	UK
Geographical elements (A)	0.383	0.886	0.233	0.573	0.000	0.421	0.577	–	–
Geographical elements (B)	0.422	0.888	0.285	0.584	0.089	0.473	–	0.625	0.067
Natural resources (A)	0.267	0.927	0.346	0.458	0.000	0.762	0.233	–	–
Natural resources (B)	0.288	0.929	0.339	0.445	0.019	0.764	–	0.212	0.023
Demography (A)	0.206	0.039	0.882	0.726	0.255	0.228	0.223	–	–
Demography (B)	0.209	0.042	0.883	0.732	0.258	0.229	–	0.189	0.109
Infrastructure (A)	0.024	0.333	0.377	0.691	0.417	0.956	0.626	–	–
Infrastructure (B)	0.031	0.343	0.397	0.689	0.407	0.962	–	0.611	0.619

The military dimension has two sub-components, namely arms trade and military infrastructure and resources, while Brexit affects the European index values for both sub-dimensions (Table 5). In terms of military infrastructure and resources, the decrease of index values for the EU affects its position within global powers. While the EU28 ranks third in this sub-dimension after the US and China, following Brexit, the EU27 becomes fourth, after India. The hierarchy of world powers remains the same on arms trade, both the EU28 and the EU27 being the second after the United States. The United Kingdom has lower scores than EU27 for all military sub-dimensions.

For the social & cultural dimension, the European index values are almost the same, but the EU's global position is changing. Analyzing its sub-dimensions, the score on the educational system decreases, affecting the EU's position, but the improvement in the value of demographic aspects mitigates this decline (Table 6). On the educational system, the hierarchy of world powers changes in sense that the UK has a better position than the BRICS countries following Brexit. In terms of human development sub-dimension, the European index values are almost the same, regardless Brexit. However, the hierarchy of world powers changes. For situation (A), the US ranks first, followed by the EU28 and Russia, whereas, for situation (B),

Table 5. Index values for sub-dimensions of military component (source: own processing)

Sub-dimension	Index values for situation (A) and situation (B)								
	Brazil	Russia	India	China	S. Africa	USA	EU28	EU27	UK
Military infrastructure and resources (A)	0.135	0.291	0.543	0.660	0.000	0.730	0.568	–	–
Military infrastructure and resources (B)	0.134	0.288	0.540	0.650	0.000	0.730	–	0.485	0.050
Arms trade (A)	0.097	0.467	0.338	0.276	0.083	0.717	0.695	–	–
Arms trade (B)	0.096	0.478	0.339	0.283	0.083	0.717	–	0.592	0.193

the UK becomes first, followed by the US and the EU27. As regarding demographic aspects, the European index values improve due to Brexit, but Russia and the US had the biggest increases. The hierarchy changes in the sense that the UK takes Russia's place and the EU falls from fifth to sixth place. In other words, the UK has a better position than EU27 on human development and demographic aspects.

Table 6. Index values for sub-dimensions of socio & cultural component (source: own processing)

Sub-dimension	Index values for situation (A) and situation (B)								
	Brazil	Russia	India	China	S. Africa	USA	EU28	EU27	UK
Educational system (A)	0.215	0.673	0.183	0.408	0.339	0.997	0.835	–	–
Educational system (B)	0.199	0.647	0.168	0.398	0.339	0.989	–	0.787	0.783
Human development (A)	0.756	0.813	0.629	0.745	0.692	0.920	0.880	–	–
Human development (B)	0.757	0.814	0.630	0.744	0.697	0.917	–	0.879	0.918
Demographic aspects (A)	0.671	0.505	0.344	0.762	0.270	0.551	0.483	–	–
Demographic aspects (B)	0.700	0.601	0.363	0.808	0.325	0.634	–	0.535	0.606

At the politics & governance component, due to the Brexit, the EU is losing the second position, being the third after the UK and the US. In addition, the UK has a better position than EU27 on all sub-dimensions (Table 7). For the political environment sub-dimension, the EU index value decreases with 0.05 points as well as the US, being the largest reduction among the world powers. At the same time, the EU loses the second place in detriment of the UK. In terms of governance performance, the EU index value records a decrease similar with South Africa and Brazil. The hierarchy modifies following Brexit since the UK ranks the second after the US and in front of China and the EU27. As regarding the public perception on political and governance aspects, the EU index value suffers a reduction of almost 0.1 points. In this case, the UK places better than the EU27 due to Brexit, while the EU falls from second to third place.

Table 7. Index values for sub-dimensions of political & governance component (source: own processing)

Sub-dimension	Index values for situation (A) and situation (B)								
	Brazil	Russia	India	China	S. Africa	USA	EU28	EU27	UK
Political environment (A)	0.327	0.132	0.351	0.234	0.512	0.975	0.823	–	–
Political environment (B)	0.309	0.129	0.336	0.222	0.484	0.925	–	0.772	0.880
Governance performance (A)	0.127	0.018	0.306	0.452	0.291	1.000	0.381	–	–
Governance performance (B)	0.090	0.022	0.325	0.435	0.255	0.983	–	0.347	0.934
Public perception (A)	0.119	0.28	0.458	0.615	0.312	0.913	0.741	–	–
Public perception (B)	0.106	0.266	0.455	0.542	0.273	0.842	–	0.646	1.000

From a technological perspective, the EU index values for innovation as well as for research and technological development are lower in situation (B) than in situation (A), according to Table 8. The lower score on innovation has the biggest negative influence on EU's global position. Following this decrease, the EU loses the first place on this sub-dimension and the hierarchy suffers a complete change. For situation (A), the EU28, the US, China occupy the first three positions, whereas for situation (B), the US ranks first, followed by the EU27, the UK and China. In addition, the EU27 has a worse position than the UK on sub-dimension related to research and technological development, losing the third place.

Table 8. Index values for sub-dimensions of technological component (source: own processing)

Sub-dimension	Index values for situation (A) and situation (B)								
	Brazil	Russia	India	China	S. Africa	USA	EU28	EU27	UK
Research and technological development (A)	0.073	0.050	0.097	0.669	0.158	0.805	0.260	–	–
Research and technological development (B)	0.069	0.047	0.099	0.670	0.162	0.800	–	0.240	0.484
Innovation (A)	0.130	0.040	0.082	0.560	0.264	0.697	0.724	–	–
Innovation (B)	0.093	0.050	0.040	0.590	0.225	0.720	–	0.688	0.616

The overall index value for the economic dimension of power is higher in situation (B) than situation (A), showing an improvement of the European economy due to the Brexit. This is the only dimension where Brexit benefits the EU. However, detailed analysis of the sub-dimensions (Table 9) shows that the productivity sub-dimension affects the EU's global position the most, while the foreign trade sub-dimension is the most performing. Nevertheless, the EU27 has a better position than the United Kingdom on almost all sub-dimensions, the only exception being the business environment.

Table 9. Index values for sub-dimensions of economic component (source: own processing)

Sub-dimension	Index values for situation (A) and situation (B)								
	Brazil	Russia	India	China	S. Africa	USA	EU28	EU27	UK
Economic output (A)	0.140	0.211	0.104	0.423	0.059	0.983	0.766	–	–
Economic output (B)	0.137	0.209	0.102	0.422	0.056	1.000	–	0.711	0.428
Economic dynamics (A)	0.000	0.168	0.964	0.986	0.156	0.341	0.306	–	–
Economic dynamics (B)	0.000	0.167	0.964	0.994	0.150	0.338	–	0.416	0.296
Business environment (A)	0.129	0.416	0.375	0.513	0.565	0.808	0.727	–	–
Business environment (B)	0.101	0.398	0.320	0.469	0.497	0.749	–	0.669	0.887
Investments (A)	0.048	0.266	0.161	0.529	0.001	0.599	0.641	–	–
Investments (B)	0.048	0.032	0.159	0.517	0.002	0.734	–	0.825	0.152
Productivity (A)	0.083	0.064	0.203	0.764	0.000	0.630	0.606	–	–
Productivity (B)	0.084	0.063	0.207	0.763	0.000	0.628	–	0.526	0.075
Foreign trade (A)	0.215	0.291	0.351	0.360	0.228	0.233	0.723	–	–
Foreign trade (B)	0.116	0.217	0.165	0.375	0.102	0.291	–	1.000	0.169

Starting with the economic output sub-dimension, the European index value in situation (B) is lower than in situation (A), suggesting a deterioration following Brexit. For the other world powers, the declines are insignificant, while the US records an improvement. In these circumstances, the EU position for this sub-dimension remains the same (second place after the US), whereas the UK has a better position than the BRICS countries.

For economic dynamics sub-dimension, the index value of the EU27 is higher than the one for the EU28 by almost 0.1 points, being the highest increase among the world powers analyzed. This improvement leads to a better position of the EU27 compared to the EU28 among world powers for this sub-dimension. In situation (A), China, India, the US and the EU28 occupy the first four positions, whereas in situation (B), China and India remain in the top two positions, followed by the EU27, the US and the UK.

All the index values for world powers show decreases for business environment sub-dimension. South Africa records the biggest reduction, while the decreases are almost the same for the US, the EU and India. At the same time, all world powers lose one position in the ranking as the UK ranks first with the highest index value.

On the other hand, the EU, the US, Brazil and South Africa increase their index values in the investments sub-dimension due to Brexit. For Brazil and South Africa, the increases are insignificant. The American index value grows with 0.14 points, while the EU records the highest among the world powers (almost 0.2 points). Russia's index value decreases by 0.23 points, affecting its position. In situation (A), the EU28, the US, China and Russia occupy the top four positions, whereas in situation (B), the top three positions remain the same and India, the UK and Brazil overtake Russia.

Changes in index values for other world powers in the productivity sub-dimension are insignificant. The EU is the most affected, as its values fall by 0.08 points. At the same time, there are no significant changes in the ranking of world powers, while, following Brexit, the UK ranks better than Russia and South Africa. Both the EU28 and the EU27 rank third, after China and the United States.

For the foreign trade sub-dimension, Brexit affects index values for almost all world powers, except the EU, the US and China. The increases for the EU, the US and China, along with the decreases for India, Brazil, Russia and South Africa lead to a repositioning of world powers due to Brexit. The EU and China remain in the top two positions, while India, Russia and South Africa follow them in situation (A). For situation (B), the US comes third, Russia fourth and the UK fifth.

4.3. Relative change in the power level of the EU

When evaluating the direction and intensity of the potential Brexit impact on the EU, we detected no shift in the ranking of the EU against the other countries. Therefore, in order to measure the prospective relative change in the power level of the EU compared to other countries, we calculated the index based on Euclidean distances (Table 10).

Table 10. Index values based on Euclidean distances (source: own processing)

Dimension	Index values					
	Brazil	Russia	India	China	S. Africa	USA
Physical	-2.365	1.437	-2.525	-7.567	-7.305	-4.828
Economics	18.036	32.746	15.372	12.121	20.750	44.036
Politics & Governance	-9.341	-10.143	-14.054	-6.600	-10.780	-3.484
Social & Cultural	-5.462	-4.545	-3.094	-6.261	-7.705	-25.966
Technological	-0.321	-6.713	0.302	-0.227	-0.212	-2.752
Military	-17.750	-36.312	-27.170	-17.990	-15.707	-68.711

The economic power is the only dimension for which the UK's exclusion has strengthened the EU's status in relation with all the other countries, the strongest reposition registering with the US and Russia, while the weakest is with China. For all the other dimensions of power, there is no relevant improvement found in the EU's status when excluding the UK, with the military dimension in lead. Brexit most affects the status of the EU in relation to the US, Russia and India for the military dimension and to the US for the social & cultural dimension, with index values above 25 points for all cases. In other words, as the EU strengthens its economic position relative to all the other powers, it weakens its status in other dimensions due to Brexit.

Analyzing each dimension, on physical component, the EU records the biggest lags in relation with China and South Africa, while the EU's status improves with Russia. The EU's reposition with Brazil and India is almost the same for this dimension. For politics & governance, Brexit has the biggest negative impact on the EU's position in relation to India, followed by the impact in relation to South Africa and Russia. The lowest negative impact is recorded with the US. For social & cultural dimension, the situation is opposite. The biggest negative impact of Brexit on the EU's position implies the relation with the US and the lowest with

India and Russia. For technological component, the results reveal a lower negative impact of Brexit on the EU's status. While the index values are close to zero for Brazil, China and South Africa, these values remain negative and increase for the US and Russia, suggesting that Brexit has the biggest negative impact for the EU's position in relation to the latter. A slightly improvement in the EU's status is recorded in relation with India for this dimension of power. For military dimension, Brexit has the biggest negative impact on the EU's status, the strongest reposition being with the US, Russia and India. At the same time, the EU's reposition with Brazil and China is almost the same.

4.4. Discussions based on the findings

The empirical findings reveal several key factors that determine the strengthened economic position of the EU following Brexit and the dominant repositioning of the UK in the politics & governance dimensions.

The multidimensional analysis of the world powers shows that Brexit influences the EU on all dimensions of power, determining significant changes of the EU's position among world powers for three dimensions (social & cultural, politics & governance and technological). For all these components, the EU is losing a position in the ranking, although the index value for social & cultural dimension is still almost the same. At the same time, UK has a better position than EU for all sub-dimensions of social & cultural component, except educational system. These findings indicate that social & cultural dimension plays a role in the manifestation of the European power globally, since the EU emphasizing its commitment to shared values and cultural diversity as a source of unity. On the other hand, the UK may leverage its cultural ties and historical relationships to build political influence, being interesting in redefine its geopolitical positioning.

As regarding the politics & governance component, Brexit influences the positions for all world powers analyzed. At the same time, Brexit affects the EU's position on all sub-dimensions, while the UK has a better position than the EU. Brexit has compelled the EU to engage in internal governance reforms. The needed adjustments that reinforce the political cohesion among remaining member states require a lot of time and effort to fulfill the void left by one of its major members. On the other hand, the need to establish new diplomatic and trade relationships outside the EU framework determines the British's significant repositioning in politics and governance dimension. This shift allows the UK greater autonomy in shaping its policies and regulations.

From a technological perspective, the EU is losing its position in detriment of the UK, since Brexit affects the EU's position on all the sub-dimensions. The UK's main priority is to establish itself as an independent actor on the global stage, designing policies aligned with its national interests, using innovative strategies and practices. On the other hand, the EU uses innovation as a tool, the main priority being the maintaining its economic strength by using its ability to innovate in response to challenges, such as redefining its trade strategies and regulatory frameworks.

For the economic dimension, Brexit has a positive influence on the EU, determining an improvement for the European economy and strengthening its position as world leader. Brexit affects the European economic output, business environment and productivity, but the benefits are more significant in terms of economic dynamics, investments and foreign trade. On the other hand, the UK has a worse position than the EU on almost all economic sub-dimensions, except the business environment. The EU's adaptability and resilience play

a crucial role in maintaining its economic strength, while the consolidation of its internal market enhances the EU's economic position, as the departure of the UK eliminated potential economic divergences and streamlined decision-making processes. At the same time, the EU's ability to negotiate and sign trade agreements on behalf of its member states has contributed to its economic resilience, mitigating potential disruptions caused by Brexit. As regarding the UK, the challenge is to forge new political alliances and trade partnerships necessary for repositioning within the global economy.

Brexit has a negative influence on the EU for the physical and military components, affecting some sub-dimensions, but the EU's global position is the same. Brexit's influence is a logic one, considering that the EU is losing advantages following the UK leaving in terms of demography, natural resources, and infrastructure. On the other hand, Brexit affects both the sub-dimensions of the military component (trade and infrastructure), but the EU still the second military power after the US. As regarding the UK, it has better position for these two components only compared to Brazil or South Africa. These findings are justified by the fact that the EU has strategically strengthened its alliances and partnerships globally, being a key player in international military governance due to the membership of the EU member countries in the North-Atlantic Alliance. In response to Brexit, the UK has sought to redefine its geopolitical positioning, searching for new political alliances.

5. Conclusions

The multipolar character of the world economy has reached an unparalleled intensity. Major events or decisions can affect the configuration of global powers and highlighting these effects requires a quantitative measurement of power through a multidimensional approach. Through Brexit, both the EU and the UK could undergo a repositioning within the power architecture. The comparison between the EU28 situation and the scenario in which the EU27 and the UK are separate entities highlights three outcomes.

First, the EU index values increase for the economic perspective of power, remain the same for social & cultural and decrease for the other dimensions. In terms of power hierarchy, for both situations, either EU28 or Brexit scenario, the EU remains ahead of the other world powers for the economic power dimension. In addition, the EU remains the second after the US in the military component, even in the Brexit case. At the same time, for physical dimension, the position of the EU27 in relation to the other powers does not change. On the other hand, there is a downward in the ranking of the EU for the social & cultural, technological and political & governance dimensions of power. These changes occur in detriment of the UK, which takes the old EU28's positions for the social & cultural and technological dimensions. However, the British economy records the most visible repositioning within the power architecture due to the Brexit for the political & governance, where the UK takes the first position to the United States.

Secondly, the in-depth analysis on the composing indicators of each dimension reveals that the increases from some sub-dimensions compensate the reductions from others. The educational system, innovation, research and technological development, and all politics & governance sub-dimensions affect the EU's position. On the other hand, Brexit determines an improvement of the European index values for the economic component of power, largely due to foreign trade.

Thirdly, in terms of distance in the power level of EU compared to the other states, EU's position has strengthened only for the economic dimension. The EU's strongest reposition is

with the US and Russia, while its weakest is with China. On the other hand, Brexit determines the biggest lags of the EU in relation with the US, for the social & cultural and the military dimensions, and with Russia and India for the military component.

A limitation of our study may be that these research results could be strengthened by triangulating them using a qualitative study by the form of in-depth interviews with experts on Brexit effects and repositioning within the world powers, considering each dimension. Nevertheless, the methodology employed in the paper may serve as assessment of the consequences that Brexit-type decisions may inflict.

The empirical findings reveal important implications for policymakers and stakeholders involved in shaping international relations. Firstly, acknowledging the strengthened economic position of the European Union post-Brexit suggests potential avenues for further collaboration and consolidation within the EU. Policymakers may consider leveraging this economic strength to enhance the EU's influence in global economic governance forums, thereby amplifying its voice on critical issues. Events such as Brexit should draw the attention of the European institutions to the fact that this phenomenon can happen again. Brexit can lead to two scenarios: either greater unity between Member States or each Member State may be tempted to follow the same pattern if its interests are not listened at European level. The European institutions need to be more careful and aware to follow the first scenario, to promote greater unity between Member States and to guarantee incentives for a more strength economic and political structure. Moreover, the European policies should promote a strengthening of economic power, a greater political integration, as well as mitigating the effects of Brexit on social & cultural, technological and political & governance components, as shown by the results of this study. At the same time, Brexit also has consequences for the EU's enlargement process. The European institutions need to pay more attention to accepting new members, as their accession may affect its stability. Inadequate preparation of potential candidates or a superficial analysis of these countries by the EU can lead to incompatibility between the parties, so that some members may at some point wish to leave the community.

Simultaneously, there are implications on the notable repositioning of the UK in political and governance power, which emphasizes the need for strategic recalibration of diplomatic and governance strategies. Policymakers in the UK could focus on leveraging this political influence to forge new alliances, negotiate favorable trade agreements, and actively participate in shaping global governance frameworks. Brexit brings a greater degree of freedom in economic and political decisions and greater liberalization in certain sectors, but diminishes the advantages it enjoyed within the EU in negotiating trade agreements with major economies. Brexit could show that the UK is incapable of honoring the commitments it has made and that is always ready to renege on them. Weakening confidence of external partners could go beyond economic issues, involving international collaboration in education, technology, military and energy.

Finally, the empirical findings underscore the importance of recognizing the interplay between different dimensions of power. Policymakers should adopt an integrated approach that considers the interconnectedness of economic, political, and other power dimensions. By doing so, nations can formulate comprehensive strategies that enhance their overall standing in the global arena. The strategic decisions and adaptations made by both the EU and the UK have shaped their respective positions in the global power architecture, reflecting the dynamic nature of international relations in the face of significant geopolitical shifts.

These findings suggest that Brexit has effects on both the European Union and the United Kingdom, influencing their global influence and competition with other economic powers. The

aftermath of Brexit has led to a nuanced redistribution of power, with implications for both the European Union and the United Kingdom. Policymakers should leverage the strengths highlighted by the study to pursue strategic courses of action that enhance their influence in specific dimensions of power.

Disclosure statement

Authors declare that they have no competing financial, professional, or personal interests from other parties.

Acknowledgment

This study was supported by the Erasmus+ programme of the European Union under the Jean Monnet Chair, 'Doing Resilient Business on the European Market' (DO RE BIZ) [project number ERASMUS-JMO-2022-HEI-TCH-RSCH-101085838].

References

- Baldwin, D. (2013). Power and international relations. In W. Carlsnaes, T. Risse, & B. Simmions (Eds.), *Handbook of international relations* (2nd ed., pp. 273–298). SAGE Publications. <https://doi.org/10.4135/9781446247587.n11>
- Bailey, D., De Ruyter, A., Hearne, D., & Ortega-Argiles, R. (2023). Shocks, resilience and regional industry policy: Brexit and the automotive sector in two Midlands regions. *Regional Studies*, 57(6), 1141–1155. <https://doi.org/10.1080/00343404.2022.2071421>
- Begg, I., & Mushovel, F. (2016). *The economic impact of Brexit: Jobs, growth and the public finances*. European Institute. The London School of Economics and Political Science. <https://eprints.lse.ac.uk/67008/1/Hearing-11---The-impact-of-Brexit-on-jobs-and-economic-growth-summary.pdf>
- Bollen, J. C., Meijerink, G. W., & Rojas-Romagosa, H. A. (2016, June). *Brexit costs for the Netherlands arise from reduced trade* (CPB Policy Brief No. 07). CPB Netherlands Bureau for Economic Policy Analysis. <https://www.cpb.nl/sites/default/files/omnidownload/CPB-Policy-Brief-2016-07-Brexit-costs-for-the-netherlands-arise-from-reduced-trade.pdf>
- Bond, I., Besch, S., Gostyńska-Jakubowska, A., Korteweg, R., Mortera-Martinez, C., & Tilford, S. (2016, April). *Europe after Brexit: Unleashed or undone?* Centre for European Reform.
- Buigut, S., & Kapar, B. (2023). How did Brexit impact EU trade? Evidence from real data. *The World Economy*, 46(6), 1566–1581. <https://doi.org/10.1111/twec.13419>
- Central Intelligence Agency. (n.d.). *The World Factbook*. <https://www.cia.gov/the-world-factbook/>
- Cornell University, INSEAD & WIPO. (2018). *Global Innovation Index 2018: Energizing the world with innovation*. (11th ed.). S. Dutta, B. Lanvin, & S. Wunsch-Vincent (Eds.). Ithaca, Fontainebleau, Geneva. https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2018.pdf
- Cornell University, INSEAD, & WIPO. (2017). *The Global Innovation Index 2017: Innovation feeding the world*. (10th ed.). S. Dutta, B. Lanvin, & S. Wunsch-Vincent (Eds.). Ithaca, Fontainebleau, & Geneva. https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2017.pdf
- Cornell University, INSEAD, & WIPO. (2016). *The Global Innovation Index 2016: Winning with global innovation*. S. Dutta, B. Lanvin, & S. Wunsch-Vincent (Eds.). Ithaca, Fontainebleau, & Geneva. https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2016.pdf
- Cornell University, INSEAD, & WIPO. (2015). *The Global Innovation Index 2015: Effective innovation policies for development*. S. Dutta, B. Lanvin, & S. Wunsch-Vincent (Eds.). Ithaca, Fontainebleau, & Geneva. https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2015.pdf

- Cornell University, INSEAD, & WIPO. (2014). *The Global Innovation Index 2014: The human factor in innovation* (2nd ed.). S. Dutta, B. Lanvin, & S. Wunsch-Vincent (Eds.). Fontainebleau, Ithaca, & Geneva. https://www.wipo.int/edocs/pubdocs/en/economics/gii/gii_2014.pdf
- Cornell University, INSEAD, & WIPO. (2013). *The Global Innovation Index 2013: The local dynamics of innovation*. S. Dutta & B. Lanvin (Eds.). Geneva, Ithaca, & Fontainebleau. https://www.wipo.int/edocs/pubdocs/en/economics/gii/gii_2013.pdf
- Dahl, R. (1957). The concept of power. *Behavioral Science*, 2(3), 201–215. <https://doi.org/10.1002/bs.3830020303>
- Dhingra, S., Ottaviano, G., Sampson, T., & Van Reenen, J. (2016, March). *The consequences of Brexit for UK trade and living standards*. (CEP Brexit Analysis No. 2). Centre for Economic Performance. https://eprints.lse.ac.uk/66144/1/_lse.ac.uk_storage_LIBRARY_Secondary_libfile_shared_repository_Content_LSE%20BrexitVote%20blog_brexit02.pdf
- Dimitrijević, D. (2023). The struggle for a new international economic order. *Política Internacional*, 5(3), 6–21. <https://rpi.isri.cu/index.php/rpi/article/view/406>
- Emerson, M., Busse, M., Di Salvo, M., Gros, D., & Pelkmans, J. (2017, March). *An assessment of the economic impact of Brexit on the EU27*. CEPS. <https://www.ceps.eu/ceps-publications/assessment-economic-impact-brexit-eu27/>
- Enerdata. (2020). *Global Energy Statistical Yearbook 2021*. <https://energydata.info/dataset/key-world-energy-statistics-enerdata>
- Felbermayr, G., Gröschl, J., Heiland, I., Braml, M., & Steininger, M. (2017, June). *Ökonomische Effekte eines Brexit auf die deutsche und europäische Wirtschaft* [Economic effects of a Brexit on the German and European economy]. IFO Institute.
- Freddy, H., & Thomas, J. (2023). Status competition: The BRICS's quest for influence in global governance. *China Report*, 59(4), 388–401. <https://doi.org/10.1177/00094455231187054>
- Gelb, L. H. (2009). *Power rules: How common sense can rescue American foreign policy*. Harper Collins.
- Glassner, M. I., & Fahrer, C. (2004). *Political geography* (3rd ed.). Wiley.
- Goldstein, J. S., & Pevehouse, J. C. (2014). *International relations* (10th ed.). Pearson.
- Haass, R. N. (2008). The age of nonpolarity: What will follow US dominance? *Foreign Affairs*, 87(3), 44–56.
- Highman, L., Marginson, S., & Papatsiba, V. (2023). Higher education and research: Multiple negative effects and no new opportunities after Brexit. *Contemporary Social Sciences*, 18(2), 216–234. <https://doi.org/10.1080/21582041.2023.2192044>
- Irwin, G. (2015, June). *Brexit: The impact on the UK and the EU*. Global Counsel.
- Jablonsky, D. (2008). National power. In B. Jr. Boone (Ed.), *Guide to national security issues: Vol. 1. Theory of war and strategy* (3 ed., pp. 126–134). U.S. Army War College. <https://layan.hukum.uns.ac.id/data/PDIH%20File/e-book/Theory%20of%20War%20and%20Strategy.pdf>
- Ke, L., Liu, Q., Han, K., & Zhang, W. (2022). The impact of Brexit on supply chain cost and Ro–Ro traffic at Dover. *Maritime Policy & Management*. <https://doi.org/10.1080/03088839.2022.2158382>
- Kebabdjian, G. (1994). *Leconomie mondiale: Enjeux nouveaux, nouvelles théories* [The global economy: New challenges, new theories]. SEUIL.
- Khanna, P. (2008). *The second world: Empires and influence in the new global order*. Random House.
- Krauthammer, C. (2002). The unipolar moment revisited. *The National Interest*, 70(3), 5–18.
- Kuzemko, C., Bloondeel, M., & Froggatt, A. (2022). Brexit implications for sustainable energy in the UK. *Policy and Politics*, 50(4), 548–567. <https://doi.org/10.1332/030557321X16510710991392>
- Lawless, M., & Morgenroth, E. (2019). The product and sector level impact of a hard Brexit across the EU. *Contemporary Social Science*, 14(2), 189–207. <https://doi.org/10.1080/21582041.2018.1558276>
- Marginean, S., Orastean, R., & Sava, R. (2020). The road to the economics of Brexit: A new direction in economic research. *Journal of Business Economics and Management*, 21(6), 1665–1682. <https://doi.org/10.3846/jbem.2020.13505>
- Marini, G. (2024). Brexit and the war for talents: Push & pull evidence about competitiveness. *Higher Education*, 1–16. <https://doi.org/10.1007/s10734-024-01186-1>
- Mearsheimer, J. (2001). *The tragedy of great power politics* (1st ed.). WW Norton & Company.

- Miller, T., Kim, A. B., & Roberts, J. M. (2019). *2019 Index of Economic Freedom: 25th Anniversary Edition*. The Heritage Foundation. https://www.iberglobal.com/files/2019-1/economic_freedom_index_2019.pdf
- Morchid, K., & O'Mahony, M. (2019). Transport sector impacts of a border between Ireland and Northern Ireland after a hard Brexit. *Journal of Advanced Transportation*, 2019, Article 9029852. <https://doi.org/10.1155/2019/9029852>
- Morgenthau, H., & Thompson, K. W. (2005). *Politics among Nations. The struggle for power and peace* (7th ed.). McGraw-Hill Education.
- Nardo, M., Saisana, M., Saltelli, A., Tarantola, S., Hoffman, A., & Giovannini, E. (2008). *Handbook on constructing composite indicators and user guide*. OECD.
- Nenci, S., & Montalbano, P. (2011). *Trade partners and trade clusters: China, India, Brazil and South Africa in the global trading system* (Working Paper No. 125). Roma Tre Università Degli Studi. <https://doi.org/10.2139/ssrn.1996821>
- Nye, J. S. Jr. (2011). *The future of power*. Public Affairs.
- Oberhofer, H., & Pfaffermayr, M. (2021). Estimating the trade and welfare effects of Brexit: A panel data structural gravity model. *Canadian Journal of Economics*, 54(1), 338–375. <https://doi.org/10.1111/caje.12494>
- OECD (n.d.). *OECD Stat*. <https://statsoecd.org/>
- Oliver, T. (2023). Reflections: the UK after Brexit. *International Politics*. <https://doi.org/10.1057/s41311-023-00472-6>
- Pausenberger, E. (1983). How powerful are the multinational corporations? *Intereconomics*, 18(3), 130–136. <https://doi.org/10.1007/BF02928572>
- Pollitt, M. (2022). The further economic consequences of Brexit: Energy. *Oxford Review of Economic Policy*, 38(1), 165–178. <https://doi.org/10.1093/oxrep/grab044>
- Prikhodko, O. (2022). Brexit's implications for the transatlantic relationship. *Herald of the Russian Academy of Sciences*, 92(2), 133–141. <https://doi.org/10.1134%2FS1019331622080093>
- Rojas-Romagosa, H. (2016, June). *Trade effects of Brexit for the Netherlands*. (CPB Background Document). CPB Netherlands Bureau for Economic Policy Analysis. <https://www.cpb.nl/sites/default/files/omnidownload/CPB-Background-Documents-June-2016-Trade-effects-of-brexit-for-the-netherlands.pdf>
- Schwab, K. (2017). *The Global Competitiveness Report 2017–2018*. World Economic Forum. <https://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf>
- Tellis, A. J., Bially, J., Layne, C., & McPherson, M. (2000). *Measuring national power in the postindustrial age*. Rand. https://www.rand.org/content/dam/rand/pubs/monograph_reports/MR1110/RAND_MR1110.pdf
- The World Bank. (n.d.-a). *World Development Indicators*. <https://databankworldbank.org/source/world-development-indicators>
- The World Bank. (n.d.-b). *Worldwide Governance Indicators*. <https://databankworldbank.org/source/world-wide-governance-indicators>
- The United Nations Development Programme. (n.d.). *Human Development Index. All composite indices and components time series (1990–2022)*. https://hdr.undp.org/sites/default/files/2023-24_HDR/HDR23-24_Composite_indices_complete_time_series.csv
- Transparency International. (2019). *Corruption Perceptions Index 2019*. <https://www.transparency.org/en/cpi/2019>
- Vandenbussche, H., Connell, W., & Simons, W. (2022). Global value chains, trade shocks and jobs: An application to Brexit. *The World Economy*, 45(8), 2338–2369. <https://doi.org/10.1111/twec.13259>
- Waltz, K. N. (2010). *Theory of international politics* (1st ed.). Waveland Press.