

## ARE EU MEMBER STATES RESILIENT TO NEW CRISES?

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### ABSTRACT

*In the contemporary landscape of global challenges and uncertainties, the significance of national resilience stands as a cornerstone for a country's ability to effectively respond to crises, maintain stability, and secure the well-being of its citizens. This study sought to assess the resilience levels of European Union (EU) countries in the aftermath of the Covid-19 crisis, through the analysis of secondary data. The investigation incorporated the FM Global Resilience Index, comprising three key indicators—economic resilience, risk quality, and supply chain resilience. To achieve the research objectives, a Two-Step Cluster Analysis and One-Way ANOVA were conducted using the SPSS statistical software. The study outcomes delineated three clusters characterizing the resilience levels of European Union countries. Notably, Denmark emerged as the most resilient country, succeeded by Luxembourg and Germany. Romania, in this context, occupies the 22<sup>nd</sup> position in the ranking. The study's implications go beyond shaping post-Covid-19 resilience policies in European Union countries, and also provide valuable insights for the specialized literature on the subject. This dual impact underscores the study's significance in both practical policymaking and academic discourse*

**KEYWORDS**, Covid-19, economic, EU member states, resilience, supply chain.

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### 1. INTRODUCTION

In the face of the unprecedented challenges posed by the Covid-19 pandemic, resilience has become a paramount quality for nations worldwide as they grapple with the multifaceted impacts of the crisis on public health, economics, and social well-being (Hornor, 2017). Therefore, resilience emerged as a focal point of research interest during significant crises. Throughout the pandemic, numerous studies were undertaken to assess the extent of resilience exhibited by various sectors, including public health institutions (Chabrol & David, 2023; Trenz et al., 2021), healthcare system (Anghel et al., 2021), the economy (Diop et al., 2021; Duan et al., 2022; Yuheng et al., 2023), and the supply chain (Ozdemir et al., 2022; Spieske & Birkel, 2021), among other affected domains.

As outlined by Chandra et al. (2011), resilience is characterized as a community's capacity to endure and bounce back from adversity. Given the constraints on resources in the aftermath of emergencies, there is growing acknowledgment that resilience plays a crucial role in minimizing the extended recovery periods that communities may face. Meanwhile, Longstaff et al. (2010) mention that resilience signifies a departure from previous strategies centered solely on anticipating risk and mitigating vulnerability. Contemporary approaches now embrace a more detailed framework that

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combines both resistance measures (preventing and protecting) and resilience measures (responding and recovering).

Nevertheless, subsequent to the resolution of this global crisis Covid-19 that has impacted the entirety of the world, there is a discernible decline in academic interest within this domain. An exploration of the Scopus database using the keywords "resilience" and "nation" reveals a diminishing trend. Specifically, in the years 2019-2020, a total of 1358 scholarly materials were published (excluding language or material type criteria). In the subsequent period of 2021-2022, this figure decreased to 801, and as of 2023, the scholarly interest further waned, resulting in only 453 published works. This situation prompts a crucial examination of potential research gaps in the field of resilience, especially in the post-crisis phase. It is essential to highlight that significant research breakthroughs frequently occur not amid the crisis itself but in its aftermath when the complete consequences become apparent. Given the apparent decline in recent research attention to this domain, we have formulated a pertinent research question:

*RQ: To what extent can European Union member states adeptly navigate and manage the challenges arising from emerging crises?*

Thus, the scope of the research involves an examination of resilience at the national level in 27 European countries following the Covid-19 pandemic. The study relies on secondary data from the year 2023, focusing on the FM Global Resilience Index (FM Global, 2023).

In the following sections, this paper provides a review of the specialized literature, offering a concise examination of the concept of resilience and the various domains explored by researchers over time. Additionally, the paper presents the quantitative research methodology employed in this study, showcasing the primary outcomes that highlight the most resilient nations in 2023. Furthermore, the ensuing discussions are rooted in these results.

## 2. LITERATURE REVIEW

Resilience is a continuous and dynamic process that involves the ability to adapt positively in the face of considerable adversity. It extends beyond being a mere trait and encompasses a multifaceted journey of growth and transformation. The capacity to bounce back and thrive amid challenges reflects inner strength and resourcefulness. Thus, resilience is not a static quality, rather, it is a fluid and evolving response to life's trials (Schoon & Bynner, 2003).

Furthermore, according to Salignac et al. (2019) the notion of resilience originated in the field of ecology (Holling, 1973) and has subsequently been explored in various disciplines, including economics (Pant et al., 2014), global environmental change (Janssen et al., 2006), and risk management (Cutter et al., 2008). In fact, resilience is most aptly described as a process characterized by adaptability rather than stability. It embodies the concept of bouncing back from adversity rather than achieving complete immunity (Davidson, 2010; OECD, 2014). This viewpoint contrasts with an outcome-oriented stance that exclusively sees resilience as the ability to rebound or cope with adverse events. However, resilience extends beyond mere recovery, it encompasses seizing opportunities that arise from disturbances (Salignac et al., 2019).

Over time, crises have served as tests of the response capacities of countries and large organizations, illustrating their preparedness and adaptability in the face of complex challenges (Boin & McConnell, 2007). The dynamic nature of resilience becomes particularly evident as nations and institutions weather unprecedented disruptions, such as pandemics, economic downturns, or environmental catastrophes. These crises underscore the importance not only of rebound, but also of strategic evolution and innovation in response to the complex and ever-changing landscape of adversity (Brada et al., 2021).

Resilient countries and organizations are not just those that return to a previous state of equilibrium after a period of crisis. Rather, true resilience is demonstrated by the ability to learn from and

capitalize on the challenges posed by crises. It involves the ability to reconfigure strategies, policies, and systems to not only withstand future shocks, but also to thrive in a transformed environment (Bristow & Healy, 2015).

In the backdrop of the COVID-19 pandemic crisis, there has been a heightened emphasis on assessing the resilience of nations, prompting numerous scholarly investigations (to scrutinize and grade a nation's economic resilience (Ahrens & Ferry, 2020; Diop et al., 2021; Duan et al., 2022; Yuheng et al., 2023), its assumed risk (Gössling, 2020; Kimhi et al., 2021), and the robustness of its supply chain (Bunea, 2021; Hobbs, 2021; Ozdemir et al., 2022; Scala & Lindsay, 2021; Spieske & Birkel, 2021). The exigencies of the ongoing global health crisis have underlined the paramount importance of understanding a nation's adaptive capacity and preparedness in the face of challenges. Furthermore, in the investigation of economic resilience, two pertinent inquiries arise (Duan et al., 2022): Why do certain regions experience a greater impact from a crisis than others, and what factors contribute to the varying pace of recovery among regions? Seeking answers, researchers introduce the concept of economic resilience within states, emphasizing the primary objective of understanding and elaborating on its determinants (Oprea et al., 2020). Taking into account contributions of Ngouhouo & Nchofoung (2022), the literature on economic resilience delineates two predominant perspectives—one centered on efficiency and the other on persistence and change. According to Dropniak (2012) economic resilience is the capacity of a nation's economy to either sustain its prior growth level following an external shock, revert to this initial growth level, or undergo a structural transformation and attain, at minimum, the previously established growth level. Briguglio et al. (2012) mention that economic resilience is assessed by evaluating the effectiveness of policies in four overarching domains: macroeconomic stability, efficiency in microeconomic markets, good governance, and social development.

As highlighted by Briguglio et al. (2005), the significance of prioritizing the development of economic resilience is particularly pronounced for small states, which inherently grapple with economic vulnerability. This emphasis stems from the recognition that the economic landscapes of smaller nations are often characterized by unique challenges and susceptibilities. Small states, due to factors such as limited resource bases, dependence on specific industries, and heightened exposure to external shocks, face an increased risk of economic instability. For small states, enhancing economic resilience is a proactive response to the ever-present challenges that can jeopardize their economic stability. It involves the formulation and implementation of policies and strategies that not only address immediate threats but also foster long-term sustainability and adaptability.

Academic discussions regarding a nation's ability to manage potential risks to which they are exposed have created different opinions over time. Thus, according to Lund et al. (2020), risk resilience in nations refers to their ability to anticipate, absorb, adapt and recover effectively from various shocks. These risks can manifest in the form of economic downturns, natural disasters, political instability, public health crises, and more. The strength of a nation's social infrastructure, which includes health, education, and welfare systems, contributes to its resilience. A well-functioning health system, for example, can mitigate the impact of public health crises. In addition, nations that prioritize environmental sustainability are more resilient to climate-related risks, as sustainable practices and policies can help mitigate the impact of natural disasters (Verschuur et al., 2020).

Wamsler & Johannessen (2020) consider that adaptive capacity, or the ability to adjust policies and strategies in response to changing circumstances, is crucial for a nation's resilience. Strong social cohesion and community resilience contribute to a nation's overall resilience, as communities that support each other during crises can help mitigate the impact and speed up recovery.

Scholarly discourse also exerts interest on the resilience of a nation's supply chain (Hobbs, 2021; Ozdemir et al., 2022; Scala & Lindsay, 2021; Spieske & Birkel, 2021). Ozdemir et al. (2022)

underscore that the impact of COVID-19 pandemic has prompted heightened awareness, necessitating a reevaluation of healthcare systems, business models, lifestyles, and diverse facets, notably including supply chain management. Hence, the pandemic has induced a more pronounced change in demand structure than in supply structure, and its impact has extended to the financial system as well. Golan et al. (2020) also note that the COVID-19 pandemic distinctly revealed the insufficient resilience in supply chains and the impact of disruptions on a global network scale, as individual supply chain connections and nodes experienced failures. Building on this perspective, it becomes apparent that supply chain disruptions are intricate, arising from the interplay of unforeseen triggering events and consequential situations within the upstream supply chain, inbound logistics network, or the purchasing environment. As elucidated by Bode & MacDonald (2017), this convergence poses a significant threat to the standard course of business operations for both nations and firms alike. Thus, the discourse on supply chain resilience delves into multifaceted considerations, emphasizing the critical need for robust strategies to mitigate the impact of unforeseen events on global and national supply chains.

### 3. METHODOLOGY

Within the realm of academic inquiries pertaining to resilience at the national level, this research aspires to assess the extent of resilience exhibited by European countries in the aftermath of the Covid-19 pandemic. To achieve this scope, the study centers its attention on the compilation of secondary data, specifically relying on the FM Global Resilience Index crafted by FM Global (2023).

The FM Global Resilience Index (FM Global, 2023) is a composite measure that equally weighs three fundamental resilience factors: economic resilience, risk quality, and the resilience of the supply chain. The scores are constrained within a range of 0 to 100, where 0 denotes the lowest resilience and 100 signifies the highest level of resilience. Each of these factors is composed of core drivers:

- The economic factor, it comprised elements such as productivity level, political risk, health expenditure, energy intensity, and another relevant core.
- The risk quality factor comprises elements such as seismic risk exposure, climate risk exposure, cyber-risk quality and another relevant factor.
- The last factor, supply chain, includes core factors such as infrastructure quality, corruption control, corporate governance, supply chain visibility and supply chain timeliness.

Also, the FM Global Resilience Index includes an indicator that integrates all three factors, the overall score called the "Country Score". Moreover, depending on this Country Score, the overall ranking of countries in terms of their resilience is also provided.

Our analysis includes all the 27 European Union member states, respectively: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain and Sweden. All analyzes in this research were based on specific data for the year 2023. Thus, to categorize European Union countries based on their resilience levels and in accordance with the dataset, we conducted Two Step Cluster Analysis using the SPSS Statistics 26. This analysis facilitated the grouping of countries into three distinct resilience zones. Additionally, to validate the precision of the outcomes, we carried out a One-Way ANOVA analysis.

## 4. RESULTS AND DISCUSSIONS

### 4.1 FM Global Resilience Index of EU countries

Table 1 shows the EU countries ranked by Country Score specific to the FM Global Resilience Index provided by FM Global (2023). Moreover, in Table 1, the score values of the three specific dimensions of a country's resilience index are highlighted, namely Economic Score, Risk Quality Score and Supply Chain Score.

**Table 1. The FM Global Resilience Index of EU countries in 2023**

Country	Country Rank at the level of EU countries	Country Score	Economic Score	Risk Quality Score	Supply Chain Score
Denmark	1	100.0	83.3	96.4	95.0
Luxembourg	2	97.3	100.0	93.5	78.1
Germany	3	96.8	79.7	97.6	90.4
Sweden	4	93.8	75.5	93.9	90.0
Finland	5	93.6	70.9	94.5	92.9
Austria	6	93.3	75.8	93.1	89.4
Belgium	7	93.2	71.2	99.4	88.3
Netherlands	8	90.0	76.3	79.5	91.6
France	9	89.7	68.6	95.3	85.9
Spain	10	87.9	64.6	99.9	82.1
Ireland	11	87.6	94.1	70.5	78.6
Czech Republic	12	83.7	65.4	96.6	75.0
Poland	13	80.3	59.8	100.0	70.1
Portugal	14	79.1	60.8	89.6	74.1
Estonia	15	77.2	65.3	84.7	69.8
Italy	16	76.7	64.7	78.0	74.0
Lithuania	17	75.2	64.6	84.0	66.7
Hungary	18	73.0	59.4	86.4	64.6
Cyprus	19	69.8	63.0	75.2	63.0
Malta	20	69.3	65.4	83.4	54.1
Slovak Republic	21	68.9	56.8	90.3	55.3
Romania	22	68.4	58.4	81.3	59.3
Slovenia	23	67.7	61.5	62.5	68.4
Latvia	24	67.6	61.6	82.6	54.3
Croatia	25	66.8	55.1	81.1	58.7
Greece	26	63.1	53.3	70.5	59.9
Bulgaria	27	61.2	48.6	77.1	55.1

*Source:* Created by the author based on data provided by FM Global (2023)

Based on the information provided in Table 1, it can be highlighted that according to the Country Score, Denmark is the most resilient EU country, followed by Luxembourg and Germany. As for



our country, Romania ranks 22nd according to the Country Score, having a higher level of resilience than Slovenia, Latvia, Croatia, Greece, and Bulgaria.

From the Economic Score perspective, the most resilient countries are Luxembourg, Ireland, and Denmark, while Croatia, Greece and Bulgaria occupy the last positions in the ranking of EU countries. Regarding the Risk Quality Score, the highest scores were obtained by Poland, Spain, and Belgium, while at the opposite side are Ireland, Greece and Slovenia. Moreover, from the Supply Chain Score perspective, Denmark, Finland, and the Netherlands obtained the highest score, proving to be the most resilient countries from this point of view, and at the opposite side, Bulgaria, Latvia, Malta proved to be the least resilient countries.

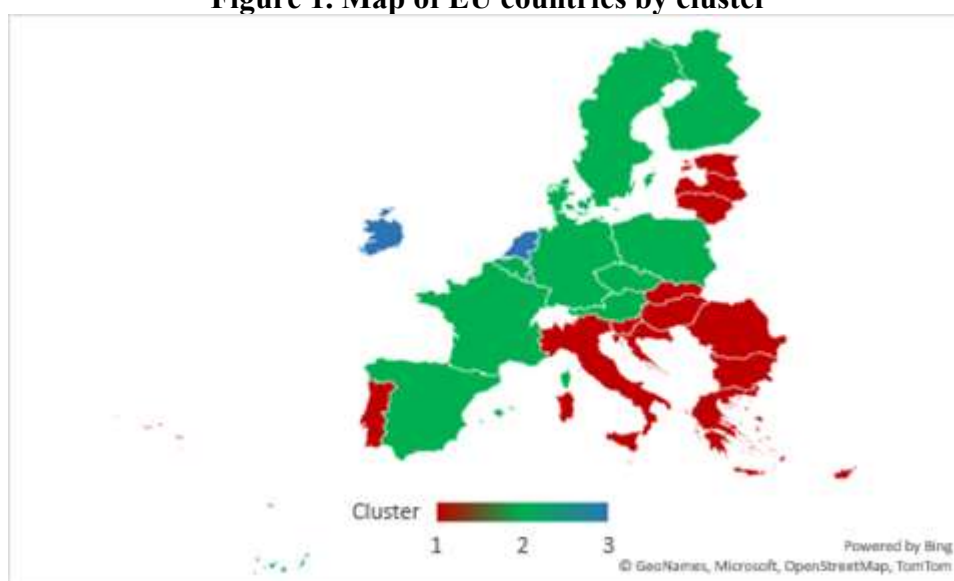
Regarding the resilience of our country for the three indicators, Romania ranks 19th from the Risk Quality Score perspective, 22nd from the Supply Chain Score perspective and 23rd from the Economic Score perspective.

#### 4.2 Cluster analysis

To identify groups of countries that are homogeneous within themselves, while also heterogeneous between each other, in terms of resilience, there was employed a Two Step Cluster Analysis, following a two-step procedure. More precisely, in this research resilience was measured by three variables, - Economic Score, Risk Quality Score, Supply Chain Score -, investigated for 27 EU member states. Although the Two-step SPSS cluster provides the ability to automatically determine the number of clusters, this initial solution was not considered adequate for the present analysis. Thus, the exact number of clusters was set at three. A successful cluster solution was indicated by the silhouette measure, which evaluates cohesion and separation to determine cluster quality, and its average value was 0.6 (Popa & Ștefan, 2015). Supply Chain Score was the variable that contributed the most to this final solution (predictor importance = 1.00), while Economic Score had a contribution of 0.55 and Risk Quality Score had a contribution of 0.45.

The cluster analysis provided valuable information on the resilience of EU countries according to the three specific variables of the FM Resilience Global Index (FM Global, 2023). A general synthesis of the three clusters according to the variables Economic Score, Risk Quality Score, Supply Chain Score is illustrated in Figure 1 and Table 2 and presented below.

**Figure 1. Map of EU countries by cluster**



*Source:* Created by the authors based on research results

**Cluster 1** – comprises 14 EU countries (51.900% of total), respectively: Bulgaria, Croatia, Cyprus, Estonia, Greece, Hungary, Italy, Latvia, Lithuania, Malta, Portugal, Romania, Slovak Republic, and Slovenia. The most important score of a country's resilience specific to this cluster is Risk Quality Score with a mean score of 80.479, followed by Supply Chain Score (M = 62.664) and Economic Score (M = 59.893). It is noted that the countries within this cluster are the least resilient compared to the countries in the other clusters because the lowest means were obtained for all three variables specific to resilience analyzed.

**Cluster 2** – holds 10 EU countries (37.000% of total), namely: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Poland, Spain, and Sweden. From the perspective of the importance of specific resilience score, this cluster is similar to Cluster 1, but the means obtained for all three analyzed variables are higher, - Risk Quality Score (M = 96.670), Supply Chain Score (M = 85.910), Economic Score (M = 71.480) -. Based on these means, it can be emphasized that the EU countries included in this cluster are more resilient compared to the countries in Cluster 1. Furthermore, it should be emphasized that the countries in this cluster are the most resilient countries from the perspective of Risk Quality Score and Supply Chain Score because the highest means of these variables were obtained at the level of this cluster.

**Cluster 3** – includes 3 EU countries (11.100% of total), respectively: Ireland, Luxembourg, and Netherlands. Unlike the other two clusters, it is noted that in Cluster 3, the most important score of a country's resilience is Economic Score with a mean score of 90.133, followed by Supply Chain Score (M = 82.767) and Risk Quality Score (M = 81.167). The countries included in this cluster stand out as the most resilient countries from the Economic Score perspective, the variable that obtained the highest means at the level of this cluster.

**Table 2. Cluster Centroids**

		Cluster		
Cluster no.		1	2	3
Cluster size		14 (51.900%)	10 (37.000%)	3 (11.100%)
Economic Score	M	59.893	71.480	90.133
	SD	5.014	7.238	12.338
Risk Quality Score	M	80.479	96.670	81.167
	SD	7.480	2.515	11.590
Supply Chain Score	M	62.664	85.910	82.767
	SD	7.086	7.957	7.654

Note: M – Mean; SD - Standard deviation.

Source: Authors' own research with SPSS Statistics 26

As recommended by Hair et al. (2010), the final cluster grouping's accuracy in predicting the results by looking for any statistically significant variations between the clusters (Breazu et al., 2023; Popa & Ștefan, 2015) was assessed. Therefore, a One-Way ANOVA analysis of variance was performed using the three resilience variables as the dependent variables and cluster membership as the independent variable. The results of all the variables (p value < 0.05) in Table 3 demonstrate the validity of the cluster and its capacity to produce precise predictions.

**Table 3. One-Way ANOVA for assessing cluster validity**

Variables	Cluster Members	F	p-value
Economic Score	(1-3)	27.262	0.000
Risk Quality Score	(1-3)	18.546	0.000
Supply Chain Score	(1-3)	30.828	0.000

Source: Authors' own research with SPSS Statistics 26

These results are similar to those of another study analyzing European Union countries characterized by a similar COVID-19 Resilience Index (CRI) based on risk and readiness scale (Aboelnaga et al., 2023). More specifically, the results showed that countries in Cluster 1 such as Bulgaria, Romania, Hungary, and Malta, but also Poland and Czech Republic, have the lowest score of the COVID-19 Resilience Index (CRI), being characterized by high COVID-19 risk and low readiness for a crisis situation (Aboelnaga et al., 2023). Similarly, the results regarding the low resilience of Cluster 1 countries, especially from an economic point of view, are consistent with the results of another study showing that Romania, Slovakia, and Latvia are the most economically vulnerable in case of a shock (Zamfir (Avram) et al., 2022).

Also, the study by Alessi et al. (2020) on the economic and financial resilience of European Union states led to a series of results and conclusions that are consistent with the results of our study. Their findings indicate significant variation in the responses of European countries to the crisis. Notably, Germany emerges as one of the most resilient nations, Ireland exhibits commendable resilience post-crisis, while Greece experiences the most severe consequences during such challenging periods. Another study (Dimian et al., 2021) divided European countries into two primary groups: Eastern Europe and Western Europe, using a cluster analysis based on the development and connectivity component. Western countries were more vulnerable to the pandemic than Eastern European countries, despite having more developed economies, stronger resilience mechanisms, and the ability to quickly implement shock reduction policies (Dimian et al., 2021).

In essence, the evolution of resilience in the context of national and organizational responses to crises highlights the need for proactive measures, continuous learning, and the cultivation of a forward-looking mindset. As the world grapples with an ever-changing landscape of challenges, the concept of resilience becomes an essential compass, guiding countries, and organizations toward not just survival but sustained prosperity in the aftermath of adversity.

## 5. CONCLUSIONS

This study aimed to evaluate the resilience of European countries in the aftermath of the Covid-19 pandemic, utilizing the FM Global Resilience Index (FM Global, 2023). The index, encompassing economic resilience, risk quality, and supply chain resilience, provided a nuanced understanding of each country's adaptive capacity. The rankings revealed Denmark as the most resilient EU country, followed by Luxembourg and Germany, while Romania positioned 22<sup>nd</sup> in the Country Score.

The cluster analysis identified three distinct groups of EU countries based on their resilience variables. Cluster 1, comprising 14 countries, exhibited the least resilience, with lower scores across all variables. Cluster 2, including 10 countries, demonstrated higher resilience than Cluster 1, while Cluster 3, with only three countries, showcased the highest economic resilience. The validity of the clusters was confirmed through One-Way ANOVA analysis, indicating statistically significant variations between clusters. Notably, the study's outcomes aligned with a similar investigation utilizing a COVID-19 Resilience Index, emphasizing the coherence of the findings.

*Implications of the study.* The practical implications of this study lie in its potential to inform policymakers, government officials, and other stakeholders about the resilience levels of European Union member states in the aftermath of the Covid-19 pandemic. By utilizing the FM Global Resilience Index and its three fundamental factors - economic resilience, risk quality, and supply chain resilience - this research provides a nuanced understanding of the strengths and weaknesses of each country in the face of challenges.

The specific indicators within each resilience factor, such as productivity level, political risk, health expenditure, seismic and climate risk exposure, cyber-risk quality, and various supply chain components, offer actionable insights for policymakers aiming to enhance their nations' resilience capacities. Ultimately, the outcomes of this research can guide strategic decision-making, resource



allocation, and policy formulation at both national and European Union levels, contributing to the overall enhancement of resilience in the face of future crises.

The theoretical implications of this study extend to the forefront of enhancing scholarly comprehension of national-level resilience, especially within the unique context of European Union member states in the aftermath of the Covid-19 pandemic. A notable aspect contributing to theoretical discourse lies in the study's temporal focus on the year 2023. This temporal specificity sheds light on the dynamic nature of resilience, offering valuable insights into the ongoing evolution of national resilience in the post-crisis landscape.

*Limitations and future directions.* The study's limitations arise from relying solely on a single resilience index. Acknowledging this constraint suggests potential areas for future research, where exploring various resilience metrics could enhance understanding of the concept. Additionally, a promising direction for subsequent investigations could involve a more focused examination of a specific country's resilience, considering a diverse array of influencing factors.

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