

From Adversity to Advantage: A Systematic Literature Review on Regional Economic Resilience

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Abstract: Recent years have been exceptionally turbulent due to various crises such as COVID-19, wars, and natural disasters. We conduct a systematic literature review to address the current state of the regional economic resilience literature, a topic regaining significance amid recent global crises. Considering the findings, we not only conduct the most up-to-date analysis of resilience types but also innovate previous research by collecting and processing data on the spatial and income features of regions, providing statistics about shock coverage, and sharing insights into region types. Additionally, we supplement the systematic literature analysis methodology by experimenting with large language models and defining new search strategies. The results show that most of the literature covers European countries, while that covering all other countries is far behind. Empirical coverage comes from high- and upper-middle-income countries (~97% of research), highlighting the lack of analysis on lower-middle- and low-income countries. This brings into question the applicability of regional resilience policies worldwide. The latest papers still mainly analyze the Great Recession, the most covered shock in the regional economic resilience literature. Not all authors have turned their attention to more recent crises. Finally, we believe future research should focus more on compound resilience—how regional economies cope with cascading or simultaneous shocks.

Keywords: regional economic resilience; systematic literature review; shocks



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1. Introduction

In recent years, the world has suffered from various crises, including the COVID-19 pandemic, increasing natural disasters, and deadly wars. Consequently, regional economic resilience has become a prominent topic in the scientific literature. The first time regional economic resilience received such comprehensive coverage from the scientific community was after the Great Recession [1], primarily due to its relevance in protecting and improving people's well-being during and after the crisis. Around the same time, scientists [2,3] attempted to explain and conceptualize the subject of regional resilience, which was still unclear at the time. The following years saw multiple attempts to further improve, expand, or even reconceptualize the crucial aspects of this phenomenon [4,5]. For more than a decade, the scientific literature has introduced various significant and thought-provoking ideas. Recent works even redefine resilience as the capacity to not only “bounce back” but also continually develop amid uncertainty, supported by attributes like diversity and adaptive learning [6]. This broader view reinforces the idea that resilience involves more than immediate recovery. Unfortunately, this means that regional economic resilience's aspects, scope, and empirical measurements are not completely clear [7,8], hindering its application to policy and decision-making.

Although there have been recent attempts [9] to bring more clarity and structure to regional economic resilience, a literature review approach is still relatively underused for this topic. Thus, we perform a systematic literature review to analyze long-standing questions about the “fuzziness” of certain regional economic resilience aspects [10]. Compared to previous research, we also expand the field of analysis by including statistics for regions’ spatial and income traits featured in empirical papers, clarifying regions’ typology, providing coverage for different years in empirical analysis, and describing the scope of specific shocks and their origins in the regional economic resilience literature. The systematic literature review methodology for this article is different in some aspects. First, our eligibility criteria are arguably more strict than those of previous reviews: empirical papers must include more than one resilience factor and at least two regions in empirical papers; regional units cannot be smaller than a city. We also define three search strategies to ensure all relevant papers are included in the analysis. Finally, we experiment with the usage of large language models during data collection.

Considering all this, we can assert that this research aims to conduct a systematic literature review on existing regional economic resilience papers to address the abovementioned issues by outlining and summarizing achievements in this field and expanding the topic by bringing new considerations into discussion. We delve into regional economic resilience to answer pivotal questions: Which resilience types dominate research? How diverse is the research typology? Which countries, categorized by geography and income, are spotlighted? What geo-units define these regions? And, crucially, what shocks are scrutinized the most, along with their causes?

Our analysis showed that resistance and recovery types were used in ~97% of regional economic resilience papers, with re-orientation (~87%) in the third place and renewal in the last place (~53%). Most papers include empirical analysis, mainly focused on high- and upper-middle-income countries from Europe. Almost half of the empirical papers used NUTS (Nomenclature of Territorial Units for Statistics) to represent regions. The economic shock was the most explored shock origin, with the specific crisis of the Great Recession being explored the most.

Even though regional economic resilience is often treated as a universal phenomenon, our analysis showed that the scientific backing for it is mainly created from research based in high- and upper-middle-income countries (while lower-middle- and low-income countries are almost ignored), focusing on economic crises, especially the Great Recession (while other types of crises only receive occasional coverage). We argue that policymakers might need to reconsider whether lessons learned from the regional economic resilience literature (which leans heavily into some specific cases) can be universally applied to prepare for and counter future crises.

2. Methodology

This systematic literature review involves the use of a reproducible method for gathering all related papers on a specific topic and synthesizing the research findings while following established guidelines and steps [11]. In addition, by leveraging this process, we try to avoid biases as much as possible. We followed PRISMA guidelines throughout this research and began the procedure by ensuring our systematic literature review process followed the below process:

1. Choosing information sources and defining search criteria.
2. Defining eligibility criteria and performing screening.
3. Conducting a full eligibility assessment for inclusion in this review.
4. Collecting data points from studies.
5. Synthesizing results based on the data points.

6. Carrying out a discussion.

2.1. The Search Criteria, Strategies, and Databases

We started the process by defining search criteria, selecting information sources, and performing searches. Our search criteria are meant to limit papers to the topic in question: only peer-reviewed research written in English and with a category or topic of regional resilience (determined by category/title/abstract/keywords). Two electronic scientific databases, Scopus and Web of Science, were used for information sources.

Three separate search strategies followed by search criteria were used to include all the essential and relevant literature from the two databases.

$$\begin{aligned} \text{TITLE} - \text{ABS} - \text{KEY} & \left((\text{economic} \right. \\ & *) \text{ AND } ((\text{"regional resilience"} \text{ OR } \text{"region resilience"}))) \text{ AND } (\text{LIMIT} \\ & - \text{TO } (\text{SUBJAREA} , \text{"SOCI"}) \text{ OR } \text{LIMIT} \\ & - \text{TO } (\text{SUBJAREA} , \text{"ECON"})) \text{ AND } (\text{LIMIT} \\ & - \text{TO } (\text{LANGUAGE} , \text{"English"})) \text{ AND } (\text{LIMIT} \\ & - \text{TO } (\text{DOCTYPE} , \text{ar}) \text{ OR } \text{LIMIT} - \text{TO } (\text{DOCTYPE} , \text{ch}) \text{ OR } \text{LIMIT} \\ & - \text{TO } (\text{DOCTYPE} , \text{cp})) \end{aligned} \quad (1)$$

$$\text{TITLE} - \text{ABS} - \text{KEY} (\text{"regional economic resilience"}) \text{ AND } (\text{LIMIT} - \text{TO } (\text{LANGUAGE} , \text{English})) \quad (2)$$

$$\text{TITLE} (\text{"regional"} \text{ AND } \text{"resilience"}) \text{ AND } \text{LANGUAGE} (\text{english}) \quad (3)$$

Formulas (1)–(3) are for Scopus Search A, Search B, and Search C queries, respectively. Please note that citation quartile calculations for Search C were conducted after the search.

$$\begin{aligned} & (((((\text{TS} = (\text{economic} *)) \text{ AND } (\text{TS} = ((\text{regional resilience}) \text{ OR } (\text{region resilience})))) \text{ AND } \text{LA} \\ & = (\text{English})) \text{ AND } \text{DT} \\ & = (\text{Article OR Book Chapter}) \text{ AND } (\text{WC} = (\text{Economics}) \text{ OR } \text{SU} \\ & = (\text{Business \& Economics}))) \end{aligned} \quad (4)$$

$$(\text{ALL} = (\text{"regional economic resilience"})) \text{ AND } (\text{LA} == (\text{ENGLISH})) \quad (5)$$

$$((\text{TI} = (\text{regional})) \text{ AND } \text{TI} = (\text{resilience})) \text{ AND } \text{LA} = (\text{English}) \quad (6)$$

Formulas (4)–(6) are for Web of Science (WoS) Search A, Search B, and Search C queries, respectively. Please note that citation quartile calculations for Search C were conducted after the search.

Search strategy A was focused on finding articles that closely matched the definition of regional economic resilience. The search based on this strategy was performed on 9 November 2023. Search strategy B aimed to cover a wider variety of sources and publishers from different disciplines—the search was conducted on 18 November 2023. Search strategy C again focused on a broader range of the literature but was limited based on the papers with the top quartile of citations from the set. This strategy was used to ensure the most influential scientific works were included in this systematic review. The final search was performed on 6 January 2024. Based on these methods, a database of ~550 papers was built after all the searches were conducted.

2.2. Eligibility Criteria

To evaluate papers further, extensive eligibility criteria were defined to prove papers' relevance to the topic by ensuring that the papers' content focused on regional resilience and was sufficient in scope. These criteria were applied to the papers returned from the searches. The entire list of eligibility criteria is as follows:

1. **Resilience Scope**—this study focuses on the entirety of regional economic resilience, which is a complex, multi-dimensional phenomenon. Focusing only on separate parts of regional economic resilience could skew the research results. Thus, papers representing regional resilience only with ecological, business, or industrial aspects were excluded.
2. **Topicality and Relevance**—regional economic resilience must be one of the core points of the study in question. Studies that only briefly mention regional economic resilience might not necessarily have enough time to present and explore such a complex phenomenon. Thus, they were excluded.
3. **Research Scope**—empirical studies that explore only one or two regions were excluded. Such a small sample of research objects means that the study in question can adequately explore the specific cases, but it does not necessarily capture a broader regional scope. Thus, it would be hard to distinguish whether the selected sample and its conclusions are unaffected by the selection basis.
4. **Multi-dimensional Aspect**—regional economic resilience is considered to be multi-dimensional. As a result, empirical studies that represented it with a single attribute (such as employment) and without any other moderating factors or details were excluded. A single attribute alone might not be able to proxy regional economic resilience complexity. Recent assessments of cities and regions employ dozens of indicators across economic, social, and environmental dimensions to evaluate performance and sustainability [12,13], reflecting the need for a comprehensive approach. In our review, we excluded studies that used a single metric for resilience because such a complex phenomenon cannot be proxied by one indicator.
5. **Regional Unit**—although some might argue about the differences between micro- and macroregions, this study decided to have a city as the smallest regional unit (and everything above—counties, states, etc.). Studies focusing mainly on firms and households were excluded, as they might not accurately represent the broader regional situation.

Figure 1 presents the PRISMA flow diagram of the inclusion of systematic literature review papers, which illustrates the entire screening and eligibility analysis process. It was prepared based on [14] and was adjusted to represent three search strategies (screened separately to evaluate search strategy effectiveness). First, a deduplication process was used to remove repeating studies between Scopus and Web of Science for every search type. Next, all papers were screened for relevance. The screening process included the title and the abstract review. In case the abstract showed that the study broke any of the eligibility criteria, the study was excluded without a full-text eligibility assessment. The deduplication process was used again to remove duplicates from different types of searches. This resulted in 210 suitable studies for complete eligibility testing. However, the authors could not retrieve the full-text versions of specific research; thus, 13 studies were excluded. Finally, a full eligibility assessment was conducted, and the same eligibility criteria were applied to all the contents of the studies. Most of the studies that ended up being excluded were quantitative as they either explored only a few regions or only had a single indicator to represent resilience, going against our view of regional economic resilience as a multi-dimensional phenomenon. The final number of studies included in this literature review is 174; they are presented in Appendix A, Table A1.

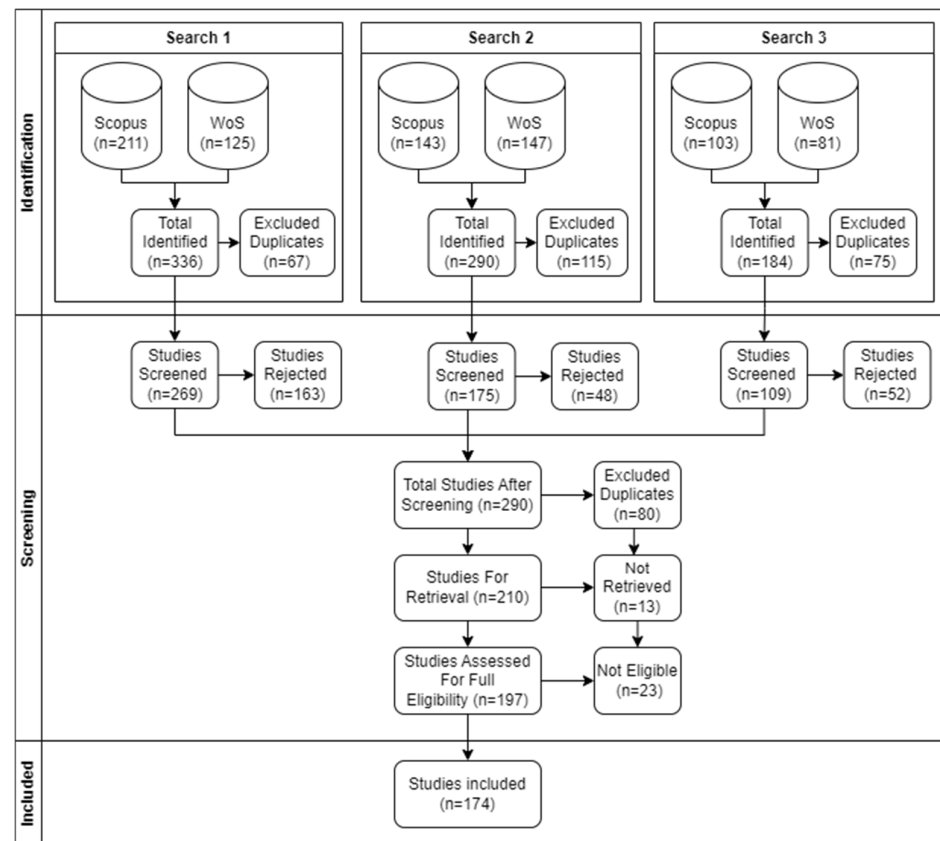


Figure 1. PRISMA flow diagram for this research's inclusion of papers.

2.3. Data Variables

For papers that met full eligibility criteria, twelve data variables were defined to answer the questions raised at the beginning of this research. Data points for each variable from every eligible study were collected, compiled, and analyzed. The entirety of the collected data could be split into five categories:

1. Resilience—arguably the most important aspect of this research. Resilience initially emerged from ecological systems theory, defined as a system's capacity to absorb disturbances and maintain its core relationships [15]. It evolved throughout the years, expanding into different disciplines and introducing new branches such as economic resilience, which also borrowed ideas from different fields, such as ecology and physics [16]. In fact, the modern resilience literature emphasizes that apart from resisting shocks, systems must adapt and even transform in response to change [17]. As time passed and the regional economic resilience concept matured, various attempts were made to describe this phenomenon more extensively. Resilience thinking acknowledges non-linear dynamics, thresholds, and uncertainties in system behavior [18], which underlines why regional economic resilience is considered a multi-dimensional and complex phenomenon. This literature analysis follows a mixed structure conceptualized by [19] and later refined by different authors, such as those of [9]. We loosely defined four different types of regional economic resilience (as the inter-relatedness of various types cannot be ignored) and tried to tie them to descriptions used by other researchers [2,4,5,20,21]. We consider the first type to be resistance (sometimes called ecological resilience or absorptive resilience), which describes how sensitive the regional economy is and how well it can absorb shocks. The second type is recovery (engineering resilience or bounce-back), which shows how fast and to what extent the regional economy recovers from a shock. The third type is re-orientation (adaptive or

evolutionary), which describes how a regional economy can adapt and rearrange itself in response to a shock. The fourth and last type is renewal (transformative), which shows a region's ability to transform itself and create entirely new, more favorable growth paths in case the old ones become untenable. One of the aims of this literature analysis is to determine which types are being described and used in every study, as "resilience" can be referred to with pretty different concepts (or a mix of concepts) in mind. This will hopefully bring clarity and understanding to discussions about the types of regional economic resilience.

2. **Geographical and Income Features**—previous literature reviews [9] have used continents as a crucial spatial metric. Thus, this research started by using a similar geographical grouping—groups of countries with respect to the World Bank's geographical split [22]. However, based on the insights from this analysis, we slightly modified the groupings to represent the clusters more clearly. Europe and Central Asia were split up as their research did not overlap. Central Asia was also expanded with the inclusion of some countries, which could be argued to be more aligned with Europe (nevertheless, the amount of research from these countries was insignificant). Due to similar reasons, Turkey was reassigned to the Middle East and North Africa. Specific groupings had very few examples, and the cluster was overly represented by one country (such as China in East Asia and the Pacific). However, we believe this grouping still represents the general distribution of research worldwide. Future research could expand in this direction to capture specific region granularity in more depth (without our restrictive eligibility criteria). This information was collected for every empirical study. In addition, we innovated the previous literature by collecting information about the income categories of the countries in question (based on the 2022 income split by the World Bank [22]). The data should highlight which geographical and income groups of countries are researched the most and which are not receiving enough coverage.
3. **Regions**—no universal description or unit representing regions exists in regional economic resilience papers. Some treat regions as large administrative divisions such as districts or provinces [23], others go smaller with cities [24], and others use statistical regional units [25]. We established a previously unclear concept of "what can be considered a region in regional economic resilience". To determine this, we collected data about regional split applied to the empirical data. Details about the Nomenclature of Territorial Units for Statistics (NUTS) levels were also collected for the European Union (in case it was used in empirical analysis).
4. **Shocks**—one of the most common motivations for researching regional economic resilience was the adverse effect of shocks. However, many shock origins, severities, and aftermaths exist. So, if an empirical study explored single or multiple periods during shocks, we tried to capture this by collecting information about the origins and names of these events. For origins, we use the system of seven different types of shocks defined by [26]. We used the exact descriptions of shock names from the studies and later combined them to represent the same historical occurrences, such as the Great Recession or COVID-19. To the best of the authors' knowledge, this is the first literature review statistically measuring the coverage of all possible shocks in the regional economic resilience literature based on papers' contents instead of publication years.
5. **Metadata**—these are essential variables such as what year the study was published, whether the study is only conceptual or has empirical analysis, and what kind of empirical methodology was used. Contrary to previous research [9], the range of empirical research coverage (the start and end year of empirical data) was also col-

lected to see which periods are empirically covered the most. These data points are meant to give insights into the regional economic resilience literature's tendencies (such as whether it is more conceptual or empirical and which periods are over- or under-researched).

Table 1 shows data variables and their possible values. Some data variables' values were initially bounded with the exact set (such as isConceptual, publishYear, etc.). In contrast, others were determined during content analysis (such as shockName and regiontype). Not all the studies had the entirety of data variables analyzed; certain studies had variables for which deterministic values could not be extracted, and some of the values were used to select which other data variables needed to be determined (for example, the methodology was only explored if isConceptual was false). Certain studies might have multiple values assigned to the same variable (for example, a study can explore shocks over a long period, meaning it would obtain assigned values such as multiple, economic, man-made, epidemic, etc.). Finally, we could not extract all of the variables for some studies because they were described too vaguely or not described at all, which would entail selecting a value without certainty.

Table 1. Data variables and their values.

Data Variable	Possible Values
rerTypes ¹	Resistance, Recovery, Re-orientation, Renewal [19]
studyByGeolocation	East Asia and Pacific, Europe, Central Asia, Latin America and the Caribbean, Middle East and North Africa, North America, South Asia, Sub-Saharan Africa, Multiple (based on the World Bank [22] and modified for this analysis)
studyByIncomeGroup	Low-income, Lower-middle-income, Upper-middle-income, High-income, Multiple (according to the World Bank [22])
regionType	City, County or District, Metro Area, State, Province, Country, etc.
euNutsClasification	NUTS classification level (if used) for European Union
shockOrigin	Economic, Institutional, Organizational, Environmental, Man-made, Technological, Epidemic [26]
shockName	Official or unofficial shock name (such as COVID-19)
isConceptual	True or False
publishYear	Positive Integer
methodology	Quantitative, Qualitative, Both
empiricalDataStartYear	Positive Integer
empiricalDataEndYear	Positive Integer

¹ Note that regional economic resilience types were assigned based on the theoretical part of articles—even if they were not accounted for in empirical calculations.

Data for eligible papers were collected and processed with the help of Microsoft Excel 2024 and Zotero 6 software. Various language models based on ChatGPT-4 (Humata.AI and SciSummary) were also used to extract the data point values to improve the review process and cross-check the authors' decisions. Afterward, the author-extracted values were compared with the values extracted by language models. In the case of discrepancies, the second author reviewed the same study to make a final decision. Large language models proved unreliable for data extraction from studies, and most of the studies had to be double-checked. Data from large language models were often incomplete or just missing but could be found by researchers. This might be due to the inaccurate questions used for the models. Still, it is more likely due to the generic, all-around language models being used for niche topics with some additional training on specific datasets. In retrospect, the authors would not recommend this approach in future literature analysis until the large language models used for scientific studies are improved.

3. Results

In total, twelve data variables in five different categories were collected and analyzed. We present statistics-based findings about the regional economic resilience literature, including metadata on published papers, spatial and income details for empirical research targets, the variety of regions' types used, the most researched origins of shocks, the specific shocks that received the most attention in the literature, and, finally, insights into how often different types of resilience were described.

3.1. Metadata

Out of 174 analyzed papers, the minority (28, i.e., 16.09%) were conceptual, and the majority (146, i.e., 83.91%) were empirical. The methodology of 146 empirical papers is split into 136 (93.15%) papers only using quantitative methods, 7 (4.79%) papers only using a qualitative approach, and 3 (2.05%) papers using both quantitative and qualitative methods.

During searches, the earliest identified papers were published in 1990, but screening processes and the application of eligibility criteria moved the earliest eligible papers' publication year to 2010. Figure 2 shows the count of papers included in this research by year. The number of papers grew from 2011 to 2023 (the last year for which papers were included). The dynamics of resilience papers, which matched our search criteria compared to the dynamics of overall published papers in Scopus and WoS, showed that the trend for the amount of regional economic resilience papers published every year grew faster than the total published papers in Scopus and WoS (based on publicly available data). In addition, Figure 3 shows the number of empirical papers covering each year in their analysis. Between 1971 and 2022, the three most covered years were 2008 (104 papers), 2010 (105 papers), and 2009 (109 papers).

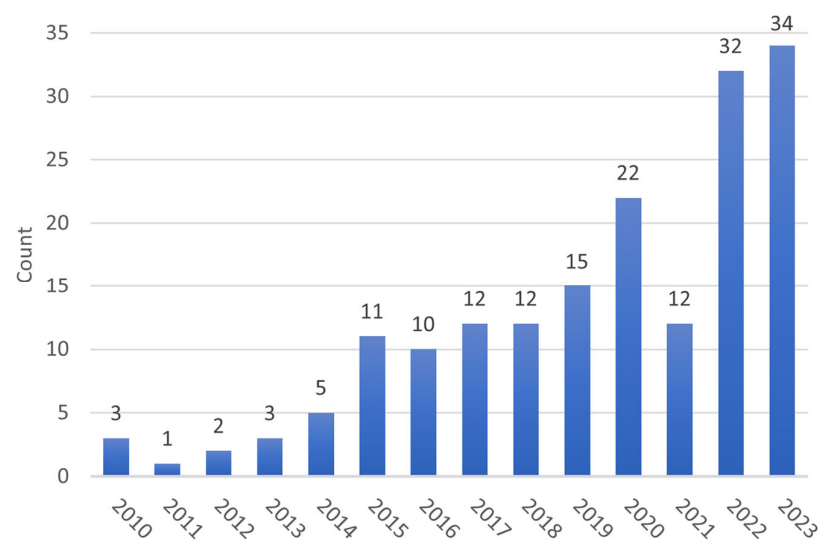


Figure 2. The count of published papers included in this research for every year from 2010 to 2023.

In addition, Figure 4 shows that variability in the gap between papers' publication years and the most recent data used in their empirical analysis has been growing, suggesting that new models are still tested on relatively old datasets. (Please note that for presentation purposes, two outliers were removed in Figure 4—one exploring natural disasters that happened 20 years before publication, and its value exceeded the scale and another one exploring the pandemic which happened the same year with empirical data only for a few months). Still, the calculated average of the gap remains relatively stable.

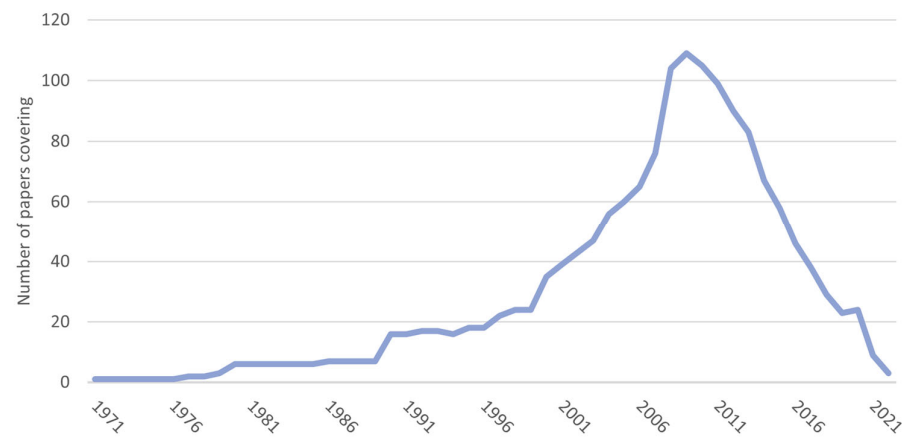


Figure 3. The number of empirical papers covering each year in their analysis.

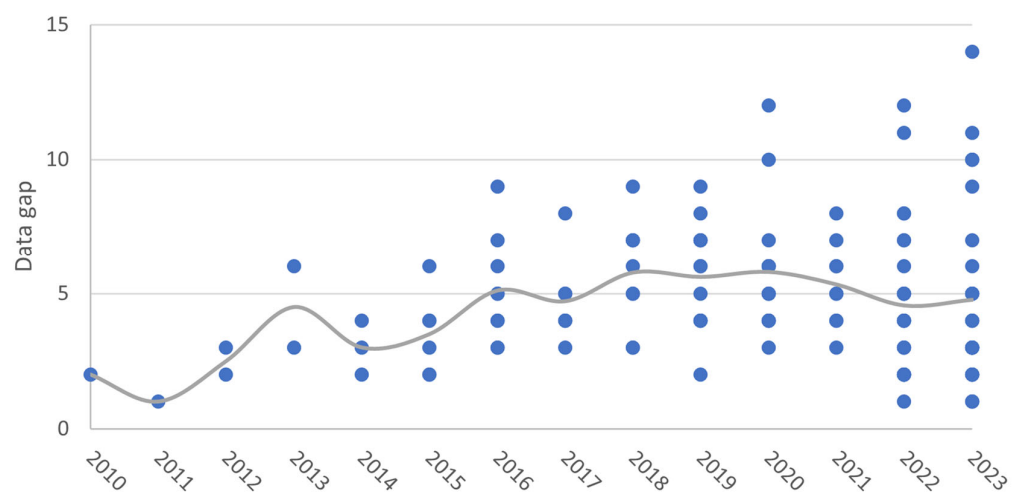


Figure 4. The gap between papers' published years and the most recent data point used in their empirical analysis. The trendline represents the average for every year.

3.2. Geographical and Income Features

Information about which groups of countries were researched in the empirical analysis was collected for 144 papers (minus 2 for which geographical information could not be extracted with full confidence). One empirical paper could include data from multiple geographical clusters; thus, 148 data points were available. Of 148, most were in Europe—85 (57.43%). East Asia and the Pacific were in second place with 35 (23.65%) papers (32 coming from China). The rest of the geographical clusters only had a small fraction: North America—thirteen (8.78%) (all thirteen coming from the USA); the Middle East and North Africa—four (2.70%) (only represented by Turkey); Sub-Saharan Africa—four (2.70%); Central Asia—three (2.03%) (only represented by Russia); Latin America and the Caribbean—three (2.03%); and South Asia—one (0.68%). The representation of geographical clusters on the world map can be found in Figure 5.

Data for countries by income groups in empirical analyses add up to 159 data points. One paper can include countries from multiple income groups. Most data points—99 (62.27%) showed that the high-income group was researched the most. The upper-middle-income group was the second, with 56 data points (35.22%). The lower-middle- and lower-income groups were the minority, with three (1.89%) and one data point (0.63%), respectively.

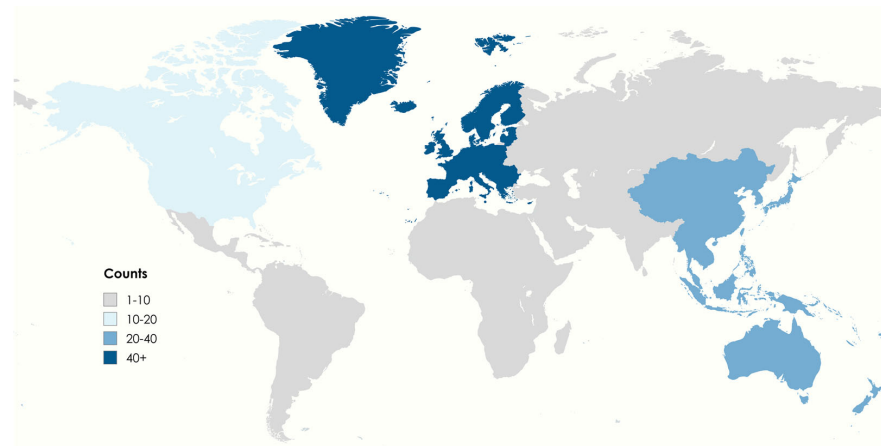


Figure 5. The geographical clusters' analyzed papers' representation on the world map. Note that a single paper could explore multiple clusters; a total of 148 data points were collected.

3.3. Regions

In addition, data for the region type used in the empirical research added up to 149 data points. One empirical paper can include multiple types of regions. The distribution of what strictly empirical papers considered as a region is as follows: 44 (29.53%) considered a region as a NUTS-2 unit, 24 (16.10%) as a city, 19 (12.75%) as a NUTS-3 unit, 10 (6.71%) as provinces, 7 (4.70%) as a metropolitan/metropolitan statistical area, 7 (4.70%) as a county, 5 (3.36%) as a district, 4 (2.68%) as a NUTS-1 unit, and 29 (19.46%) as another (administrative or statistical) division (such as less than three occurrences of the entire country, prefecture, state, industrial park, etc., or just as a region, without specifying the exact type).

3.4. Shocks

A total of 112 papers out of 174 focus on specific shocks. Note that one paper can include multiple shocks with the same or different origins, so 127 data points were collected. The distribution of shock origins is as follows (Figure 6): the majority—93 (73.23%)—were economic; 20 (15.75%) were epidemic; 7 (5.51%) were institutional; 4 (3.15%) were environmental; and 3 (2.36%) were man-made. Two types of shock origins did not appear in the empirical papers—organizational and technological. Of all shocks, two specific shocks dominated the research—92 papers explored the Great Recession shock of 2007–2009, and 20 papers explored the recent COVID-19 pandemic. The rest of the specific shocks only had one or two papers focusing on them.

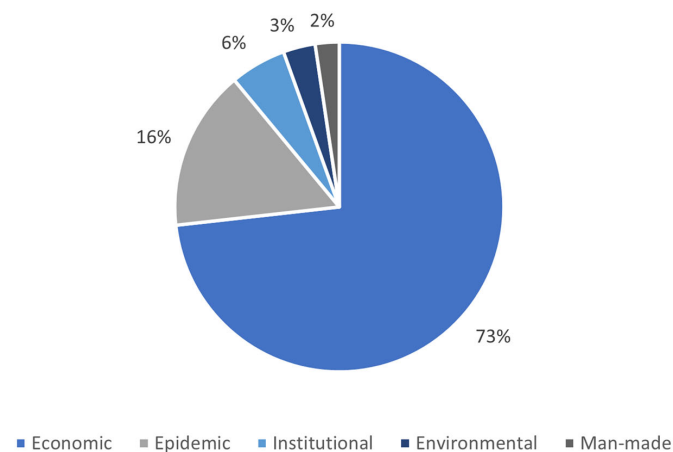


Figure 6. The percentages for shock origins. Organizational and technological shocks had zero representation in the dataset, so they were not included. The labels from left to right follow the percentages from the highest (economic, 73%) to lowest (man-made, 2%).

3.5. Resilience

The summary of resilience statistics is shown in Table 2 (the total number of papers eligible for evaluating types was 174). Resistance (missed in only six papers) and recovery (missed in only five papers) types were discussed in more than 90% of the papers. Re-orientation followed closely with ~87% coverage, and only 23 papers missed the type. The least mentioned type was renewal, with just a little more than half of the papers exploring this aspect (missing in 82 papers).

Table 2. The distribution of resilience types in this systematic literature review. The total number of papers—174.

Resilience Types	Count	Included in Papers (%)
Resistance	168	96.55%
Recovery	169	97.13%
Re-orientation	151	86.78%
Renewal	92	52.87%

As Figure 7 shows, all types of resilience are discussed, starting with the earliest eligible papers. Still, the most advanced type, i.e., renewal, always lags behind the other types. Note that this might be due to the similarities between re-orientation and renewal. Some authors might have treated them as the same evolutionary concept. During the analysis of the selected articles, it was often difficult to distinguish whether the authors of the analyzed paper meant only re-orientation, renewal, or both. In short, the certainty of the definition of renewal type across articles was lower than that of the other types.

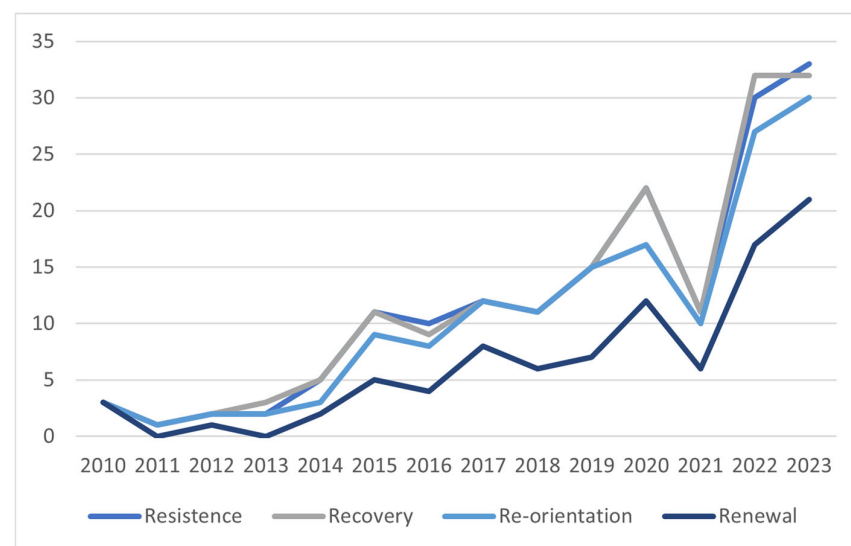


Figure 7. Resilience dimensions in the analyzed literature's frequency per year.

4. Discussion

The systematic literature data point results allow us to argue that regional economic resilience is not an unclear concept. However, the empirical aspect of this phenomenon is heavily concentrated in specific geographical clusters in higher-income countries (Europe) and a few particular crises (the Great Recession, COVID-19). This empirical focus might be skewing our understanding of regional economic resilience in different geographical clusters and giving false security regarding preparedness for future shocks (as many shock types and origins exist). Policymakers focusing on different geographical clusters, income levels, or kinds of shocks compared to the existing empirical norm should dedicate

additional research to fully grasping the implications of applying the existing regional economic resilience literature findings to their sphere of influence.

Even though eligibility criteria were arguably stricter for empirical papers than conceptual ones, most analyzed publications had empirical models and used a quantitative methodology. Conceptual papers were in the minority, indicating that theoretical research in regional economic resilience is not yet oversaturated. Also, the amount of research on this topic has increased in the past decade, highlighting the interest in and importance of regional economic resilience.

Quantitative methods dominate the field of regional economic resilience, with very few purely qualitative studies. The scarcity of qualitative and mixed-method research means that contextual, on-the-ground insights into regional resilience might be underrepresented. An over-reliance on quantitative approaches might overlook nuanced factors (like community behavior or governance quality) that qualitative case studies could capture in a clearer light and suggest a gap for future research to address. While micro-level studies did not meet the criteria for this analysis, they could still provide important insights and should be synthesized qualitatively in future work.

The top two leading country groups in this research (~81%) were Europe and East Asia and the Pacific. Other groups of countries such as North America, Central Asia, the Middle East and North Africa, Latin America and the Caribbean, Sub-Saharan Africa, and South Asia trail behind. This highlights the possibility that regional economic resilience might be focused too much on just two geographical clusters. This could be especially dangerous if policy decisions are based on research dominated by European countries or China, yet policymakers apply them to other countries without further investigation. The most popular representations of regions were NUTS-2, NUTS-3 (exclusive to the European Union), and cities. The key player is most likely the availability and collection of statistics, as different types of regions collect different types of data, and NUTS regions have extensive coverage for various factors. Further research might be needed to see how a choice of region type might affect empirical research findings.

The majority of the research focuses on high-income and upper-middle-income countries (~97%). A potential obstacle for further research on lower-income countries is most likely the lack of reliable statistics and lack of political motivation. These two hurdles must be overcome to extend the understanding of regional economic resilience to less fortunate countries. Similar to the previous point, researchers and policymakers should pay attention to the fact that regional economic resilience research might not be as advanced in lower-income countries, and the key aspects for these countries might differ from what we expect.

The most covered shock origins are economic and epidemic. This can be partially attributed to the last two major global crises: the Great Recession of 2007–2009 (economic shock) and COVID-19 in 2020 (epidemic shock). These shocks have the most extensive statistics, and their impact has been felt worldwide, so research is expected to focus on them to understand and hopefully prevent such shocks in the future. Other recent shocks might not have the required extensive data available just yet; however, the shocks that occurred before the Great Recession are not covered too extensively either. Even if the Great Recession brought out the importance of regional economic resilience, the resilience concept has been around for much longer. Researchers should not overlook shocks that happened more than 30 years ago, which might offer a wider variety of crises to explore (if it is possible to retrieve required statistics) as only a small fraction of papers look into older data, which could potentially shed light on essential lessons we can learn while dealing with regional economic resilience. Moreover, based on the collected data, we see that the variability in the gap between papers' publication years and the most recent data

point used in their empirical analysis is growing steadily—newer papers still use the Great Recession period data in some cases. Having all of this in mind, further research looking into innovating the previous empirical literature might want to focus on either much older or more recent shocks, as the period between the Great Recession and COVID-19 seems to have already been covered quite extensively.

Despite some researchers analyzing and comparing multiple crises, only a few articles focused on compound resilience—how regional economies cope with cascading or simultaneous shocks. Recent global events (such as COVID-19, supply chain disruptions, and the Russo-Ukrainian war) suggest this is crucial, yet the literature (as reviewed) has not explicitly covered it. This brings to our attention the possibility of the literature oversimplifying regional economic resilience by treating shocks in isolation in most cases. Moreover, other major crises—such as environmental disasters, climate-related shocks, technological disruptions, or large-scale social upheavals—receive comparatively less attention despite their potentially profound impact on regional economic resilience. The prevailing “economic–epidemic–European” bias in the literature may distort our global understanding of resilience, particularly for regions that frequently endure environmental shocks (e.g., floods, hurricanes, droughts) or institutional disruptions (e.g., political instability), which are equally critical to shaping long-term adaptability.

This systematic literature review shows that three out of four types of resilience have extensive theoretical coverage in the literature. Resistance, recovery, and re-orientation seem to have become the inherent aspects of regional economic resilience. Although the renewal type of resilience lags behind, it is still explored in more than half of the papers. We argue that, over time, renewal will gain more attention and catch up with the other resilience types as researchers recognize its importance. Additionally, the distinction between renewal and re-orientation remains underexplored. More conceptual studies could help clarify these differences until both receive coverage comparable to resistance and recovery. Finally, to advance the types of regional economic resilience even further, we might want to take a look back at interdisciplinary studies, as the concept of resilience and its types mainly originates from other disciplines.

Our systematic literature review deviated slightly from the traditional approach in certain aspects, such as search methods and the use of large language models. Typically, systematic literature reviews vary in how they define search strategies, depending on the research field and the information sources utilized. The authors described their search strategies to cover as much of the topical literature as possible. The three different strategies for searching provided a larger dataset of publications compared to just one search strategy. For strategies, the percentages for inclusion after screening were 39.4%, 72.6%, and 52.3% for search strategies A, B, and C, respectively. Strategy B was the most accurate, accepting the broader variety of disciplines (and resilience is an interdisciplinary concept). However, we believe the accuracy of different strategies would vary for various topics, and further applications would be needed to determine which search strategy is superior.

This systematic literature review could present inaccurate results if the initial searches did not cover the topic extensively or if data points were collected without complete confidence in their accuracy during the analysis of eligible papers. Thus, the authors would argue that the initial searches are as important as eligible papers’ assessment of the correctness of results.

Although, following [27,28], large language models provide a decent substitute for a researcher during data collection from papers, their reliability is still fuzzy and not proven. The authors do not recommend replicating this approach just yet (as we had to double-check almost all the results of all large language models) until the models’ accuracy improves.

One way to improve model accuracy would be to standardize an article's structure and sections across different journals and publishers. However, this is highly unlikely to occur. Instead, we suggest starting with a small summary/instructions section dedicated and personalized for large language models to parse, similar to what is being conducted with abstracts for scientists. By providing guidelines and cues for models about the rest of an article, we could likely improve the certainty of answers they provide.

The authors also acknowledge the limitations of this research and suggest ways it could be improved in the future. First, the most important limitation of this paper is the separation between the re-orientation and renewal types during analysis. Some authors tended to combine them in their descriptions of regional economic resilience types, which meant that it was up to us to decide whether re-orientation, renewal, or both types were described in the papers. In hindsight, a more defined classification system or rules should have been established after discovering this uncertainty. Second, including more information sources in the searches and covering papers in different languages could provide an even more accurate state of regional economic resilience research. In addition, despite using three different search strategies and two different databases, we must acknowledge that the final dataset did not include all of the relevant regional economic resilience papers. Future literature reviews might explore the possibility of using our described strategies in tandem with other methods, such as snowballing (citation chaining), to build a more thorough dataset. Finally, understanding resilience in regional economies could be advanced further by collecting and analyzing details about what kind and how often proxies (such as labor, GDP metrics, etc.) are used to represent resilience and its factors in empirical research.

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Abbreviations

The following abbreviations are used in this manuscript:

PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
NUTS	Nomenclature of Territorial Units for Statistics

Appendix A

Table A1 presents the research that met all eligibility criteria and was included in the final dataset. Due to the large volume of data, the table below provides a summary of key variables for clarity. The full detailed dataset is available from the authors upon reasonable request, provided it is used solely for research purposes.

Theoretical research contained fewer data points, and some empirical studies used multiple or vaguely defined regional classifications (other). Additionally, certain studies examined no shocks or multiple shocks, or the origins of the shocks (based on the years analyzed) could not be determined with full confidence. The dimensions of regional resilience were extracted based on the theoretical framework and terminology used in each study.

Abbreviations specific to the table include regional classifications such as East Asia and the Pacific (EAP), Europe (EU), Central Asia (CA), North America (NA), Latin America and the Caribbean (LAC), South Asia (SA), the Middle East and North Africa (MENA), and Sub-Saharan Africa (SSA). Income group classifications include high income (H), upper-middle income (UM), lower-middle income (LM), low income (L), high and upper-middle income (HUM), and lower-middle and low income (LML).

Table A1. The research included in the final analysis.

Reference	Methodology	Grouping	Income	Region	Shock	Dimensions
[29]	Quantitative	NA	H	Counties	Economic	4
[30]	Quantitative	EAP	H	Industrial Parks	Multiple	4
[31]	Quantitative	EAP	UM	Cities	-	4
[32]	Quantitative	EAP	UM	Cities	Economic	4
[33]	Quantitative	EU	H	NUTS-2	Economic	2
[34]	Quantitative	EAP	UM	Cities	Epidemic	4
[35]	Quantitative	EAP	UM	Cities	-	3
[36]	Quantitative	EAP	UM	Provinces	Epidemic	4
[37]	Quantitative	EU	H	NUTS-2	Economic	4
[38]	Quantitative	EAP	UM	Cities	-	4
[39]	Quantitative	EU	H	Other	Economic	4
[40]	Quantitative	EAP	UM	Prefectures	Economic	4
[41]	Multiple	EAP	UM	Provinces	Epidemic	3
[42]	Quantitative	NA	H	Metropolitan areas	Economic	2
[43]	Quantitative	EAP	UM	Other	-	3
[9]	Theory	-	-	-	-	4
[44]	Quantitative	EU	H	Cities	Multiple	3
[45]	Quantitative	EU	H	Other	-	1
[46]	Theory	-	-	-	-	4
[47]	Quantitative	EU	H	NUTS-2	Economic	2
[48]	Quantitative	MENA	UM	Provinces	Multiple	3
[49]	Quantitative	CA	UM	Other	Epidemic	4
[50]	Quantitative	EAP	UM	Cities	Environmental	3
[51]	Quantitative	LAC	UM	Microregions	Epidemic	4
[52]	Theory	-	-	-	-	4
[53]	Quantitative	NA	H	Metropolitan areas	Economic	3
[54]	Quantitative	EU	H	NUTS-3	Economic	4
[55]	Quantitative	EU	H	NUTS-3	Epidemic	4
[56]	Quantitative	EU	H	Other	Economic	3
[57]	Quantitative	EU	H	Other	Economic	4
[58]	Quantitative	NA	H	States	Economic	4
[59]	Quantitative	EAP	UM	Multiple	-	1
[60]	Quantitative	EAP	UM	Provinces	-	4
[61]	Theory	-	-	-	-	4
[62]	Quantitative	EU	H	NUTS-2	Economic	3
[63]	Qualitative	-	-	Other	-	4
[64]	Quantitative	EAP	UM	Cities	-	3
[65]	Quantitative	EAP	UM	Cities	Economic	3
[66]	Quantitative	EAP	UM	Cities	Economic	3
[67]	Quantitative	NA	H	Metropolitan areas	-	4
[68]	Quantitative	MENA	UM	NUTS-3	Epidemic	4
[69]	Quantitative	SSA	LM	Other	Multiple	3
[70]	Quantitative	EAP	UM	Cities	-	4
[71]	Quantitative	EU	Multiple	NUTS-2	Economic	2
[72]	Quantitative	NA	H	Counties	Epidemic	1
[73]	Qualitative	SSA	UM	Conservancies	Epidemic	3
[74]	Quantitative	EU	H	NUTS-3	Economic	3

Table A1. Cont.

Reference	Methodology	Grouping	Income	Region	Shock	Dimensions
[26]	Theory	-	-	-	-	4
[75]	Quantitative	EAP	UM	Provinces	Economic	4
[76]	Quantitative	EU	H	Other	Multiple	2
[77]	Quantitative	EU	H	Other	Economic	4
[78]	Quantitative	NA	H	Metropolitan areas	Economic	3
[79]	Multiple	EU	H	NUTS-2	Economic	2
[80]	Quantitative	EAP	UM	Provinces	Multiple	3
[81]	Quantitative	EU	H	Metropolitan areas	Economic	4
[82]	Quantitative	EU	H	NUTS-2	Economic	4
[83]	Quantitative	CA	UM	Other	Epidemic	3
[84]	Quantitative	EU	H	NUTS-2	Economic	3
[85]	Quantitative	EAP	UM	Cities	Epidemic	3
[86]	Theory	-	-	-	-	4
[87]	Quantitative	EAP	UM	Counties	Environmental	3
[88]	Quantitative	EU	H	NUTS-3	Economic	4
[89]	Quantitative	EAP	UM	Provinces	Economic	4
[23]	Quantitative	EAP	UM	Provinces	Epidemic	4
[90]	Quantitative	EAP	UM	Cities	Epidemic	4
[91]	Quantitative	EAP	UM	Cities	Multiple	3
[92]	Quantitative	Multiple	Multiple	Countries	Economic	3
[93]	Quantitative	EU	H	NUTS-2	Economic	4
[94]	Quantitative	EAP	H	Other	Economic	4
[95]	Quantitative	EU	H	Districts	-	3
[96]	Quantitative	NA	H	Counties	Economic	1
[97]	Theory	-	-	-	-	4
[98]	Quantitative	EAP	UM	Other	Economic	4
[99]	Quantitative	EU	H	NUTS-2	-	3
[100]	Quantitative	EU	H	NUTS-3	Economic	4
[101]	Quantitative	EU	Multiple	NUTS-3	Economic	4
[102]	Quantitative	EAP	UM	Cities	Economic	2
[103]	Quantitative	LAC	UM	Microregions	Multiple	3
[104]	Quantitative	EU	Multiple	NUTS-2	Economic	4
[105]	Quantitative	EU	H	NUTS-2	Economic	3
[106]	Theory	-	-	-	-	4
[107]	Quantitative	EU	H	NUTS-3	Economic	2
[108]	Quantitative	EU	H	NUTS-2	Economic	4
[109]	Quantitative	CA	UM	Other	-	3
[110]	Theory	-	-	-	-	4
[111]	Quantitative	EAP	UM	Cities	-	3
[112]	Theory	-	-	-	-	4
[113]	Theory	-	-	-	-	3
[114]	Quantitative	EU	Multiple	NUTS-3	Economic	2
[115]	Quantitative	EAP	UM	Cities	Economic	4
[7]	Quantitative	EAP	UM	Provinces	Epidemic	4
[21]	Theory	-	-	-	-	4
[116]	Quantitative	EU	H	NUTS-2	Economic	2
[117]	Quantitative	EU	H	NUTS-3	Economic	4
[118]	Quantitative	EU	Multiple	Other	Economic	2
[119]	Quantitative	EU	H	Counties	Multiple	3
[24]	Quantitative	EAP	UM	Cities	-	4
[120]	Quantitative	EU	H	NUTS-2	Economic	4
[121]	Quantitative	EU	Multiple	NUTS-2	-	2
[122]	Quantitative	NA	H	States	Economic	4
[123]	Quantitative	EU	H	Cities	-	3
[124]	Quantitative	EU	H	Other	Economic	3
[125]	Quantitative	EU	H	Other	Economic	4
[126]	Quantitative	EU	H	NUTS-2	Economic	3

Table A1. Cont.

Reference	Methodology	Grouping	Income	Region	Shock	Dimensions
[127]	Quantitative	EU	H	Districts	Economic	3
[128]	Quantitative	EU	Multiple	NUTS-2	Economic	4
[129]	Quantitative	EU	H	NUTS-2	Economic	4
[130]	Quantitative	EAP	UM	Cities	-	4
[131]	Theory	-	-	-	-	4
[132]	Quantitative	EU	Multiple	Districts	-	3
[133]	Quantitative	EU	H	NUTS-3	Economic	4
[134]	Quantitative	EU	H	Cities	Multiple	3
[135]	Quantitative	EU	H	NUTS-2	Economic	3
[136]	Quantitative	EU	H	NUTS-2	Economic	4
[137]	Quantitative	EU	H	NUTS-2	-	3
[138]	Quantitative	EU	H	NUTS-2	Economic	3
[139]	Quantitative	EU	H	NUTS-2	Economic	3
[140]	Quantitative	EU	H	Other	Economic	4
[141]	Quantitative	EU	Multiple	Other	Economic	3
[142]	Theory	-	-	-	-	-
[143]	Quantitative	EU	H	Districts	-	4
[144]	Theory	-	-	-	-	3
[145]	Quantitative	EU	H	Other	Economic	4
[146]	Quantitative	EU	Multiple	Other	Economic	4
[10]	Qualitative	-	-	Other	-	4
[147]	Quantitative	EU	H	NUTS-2	-	3
[148]	Quantitative	EU	H	NUTS-2	-	4
[16]	Theory	-	-	-	-	4
[25]	Quantitative	EU	Multiple	NUTS-2	Economic	4
[149]	Quantitative	EU	H	NUTS-2	-	4
[150]	Quantitative	EU	H	NUTS-2	-	4
[151]	Theory	-	-	-	-	4
[152]	Theory	-	-	-	-	4
[153]	Quantitative	EU	H	Other	Economic	4
[154]	Quantitative	EAP	UM	Cities	Economic	3
[155]	Quantitative	EU	H	NUTS-2	-	3
[156]	Quantitative	SSA	UM	Other	Economic	3
[157]	Theory	-	-	-	-	3
[158]	Qualitative	EU	H	Other	-	4
[159]	Quantitative	MENA	UM	NUTS-2	-	3
[160]	Quantitative	Multiple	H	Multiple	Economic	2
[161]	Quantitative	EU	H	Multiple	Economic	3
[162]	Quantitative	EU	H	Other	Economic	3
[163]	Quantitative	NA	H	Metropolitan areas	Economic	2
[164]	Quantitative	EU	H	NUTS-3	Economic	2
[165]	Quantitative	MENA	UM	NUTS-2	Economic	4
[166]	Quantitative	EU	H	NUTS-3	Economic	4
[167]	Qualitative	EU	H	Other	Economic	4
[168]	Quantitative	EU	H	NUTS-2	Economic	4
[5]	Theory	-	-	-	-	4
[169]	Quantitative	NA	H	Counties	Environmental	3
[170]	Quantitative	EU	H	NUTS-2	Economic	3
[171]	Quantitative	EU	H	Other	Economic	2
[172]	Theory	-	-	-	-	4
[1]	Quantitative	EU	H	NUTS-2	Economic	2
[173]	Theory	-	-	-	-	4
[174]	Theory	-	-	-	-	4
[175]	Quantitative	EU	H	NUTS-2	Economic	3
[176]	Quantitative	EU	H	NUTS-2	Economic	3
[4]	Theory	-	-	-	-	4
[177]	Quantitative	EU	H	NUTS-2	Economic	3

Table A1. Cont.

Reference	Methodology	Grouping	Income	Region	Shock	Dimensions
[178]	Quantitative	EU	H	Multiple	Economic	4
[179]	Theory	-	-	-	-	3
[180]	Theory	-	-	-	-	4
[181]	Quantitative	EU	H	NUTS-2	Economic	2
[182]	Quantitative	NA	H	Counties	Environmental	3
[183]	Qualitative	EU	Multiple	Other	-	3
[184]	Quantitative	EU	H	NUTS-3	Economic	1
[19]	Quantitative	EU	H	NUTS-1	Multiple	4
[185]	Quantitative	EU	H	Other	-	3
[186]	Multiple	EU	H	Multiple	Economic	3
[20]	Theory	-	-	-	-	4
[187]	Theory	-	-	-	-	4
[2]	Quantitative	EU	H	Cities	-	4

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