

A Bibliometric Analysis in the Topic of Economic Resilience and Disturbance

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Abstract

The goal of this study is to look at the results of economic resilience research, publication trends, author collaboration, title term trends, and statistics on the state of economic resilience articles from 2015 to 2020 that have been published on database sources, such as google scholar, science direct, dimension. Publish or perish is the software used to search scientific journals. VOSviewer is a program that allows you to perform bibliometric analysis and see the results. According to the density visualization map, there are few studies on economic resilience and disturbance for the topics economic resilience for the topic of resistance assessment, disaster resilience, disturbance, supply chain resilience, external disturbance, so there are still opportunities for research. The findings of the investigation give data for economic resilience research. The control model must be positioned in the perspective of economic resiliency. Economic resilience implies unwanted conditions and disturbance levels. Based on the findings, a new technique for assessing economic resilience at the city level is required that takes into consideration the interrelationship between three types of variables: disturbance variable, control variable, and control variable.

Keywords

Bibliometric Analysis, disturbance, economic resilience, Vosviewer.

1. Introduction

Economic development is directed at meeting the living needs of the people, nation and state as well as increasing the capacity and quality of adequate national resources in order to achieve a sustainable competitive advantage (Sukono et al., 2021). National resilience is a dynamic condition of a nation that covers all aspects of integrated national life, contains tenacity and resilience that contains the ability to develop national strength, in facing and overcoming all challenges, threats, obstacles and disturbances both coming from outside and from within, to ensure identity, integrity, survival of the Nation and State and the struggle to achieve national goals (Indonesian National Resilience Measurement Laboratory, 2015). Indonesia's economic conditions have progressed since the economic crisis in 1997 to 1998. Over the past 20 years, Indonesia has faced various pressures in the economic sector from outside. The policy changes that have been made in the banking sector, monetary sector, and institutional institutions after the monetary crisis in 1997 to 1998 have strengthened the resilience of the Indonesian economy.

In recent years, the study of resilience of regional and local systems has become a popular topic in relation to the increasing of economic, social and environmental shocks. Despite the theoretical framework has been enriched through definitions and empirical investigations, accordance in measurement is still missing. This paper aims to enlarge the discussion of regional economic resilience in the face of natural disasters through the construction of the indices of resistance and recovery for Japanese prefectures stricken by major earthquakes. These measures may help to identify changes in employment due to the occurrence of a natural shock (Oliva, Lazeretti, 2018). Fingleton et al (2015) explain that regional economic resilience is a term used to broadly describe how the regional economy responds to unwanted external disturbances. In essence, the notion of regional resilience emphasizes the ability of regions to resist and recover from shocks. Strengthening economic resilience for quality and equitable growth is included in National Priority One in the Government of Indonesia Work Plan 2021. The plan carries the theme "Accelerating Economic Recovery and Social Reform" (Government Work Plan, 2020). Economic resilience is a strategic issue of the Indonesian State. This is reflected in the statement: Bank of Indonesia-BI policy synergy, government and related authorities are strengthened to maintain economic resilience and encourage economic growth (Januaviani et al., 2020a; Januaviani et al., 2020b). National economic resilience is currently in a fragile state. Strengthening economic resilience is also a key recommendation in the Policy Brief: Strengthening Macroeconomic Resilience & Competitiveness for the Acceleration of Inclusive & Quality Economic Growth (Ramda, 2020).

1.1 Objectives

The study of economic resilience literature is very necessary before conducting research. The study of economic resilience literature is a series of processes to study the results of research that has been published by previous researchers in support of economic resilience and disturbance research that is being carried out. The purpose of conducting a scientific review on economic resilience is to provide an overview of the development of economic resilience research topics that have been published from 2015 to 2020. This study aims to map the research area with the topic of economic resilience and disturbance, to provide an overview for further research on the topic of economic resilience and disturbance research. This paper covers the findings of a literature review as a first step in determining the hypothesis that there are study materials linked to the establishment of an economic resilience model that may be explored.

2. Literature Review

The concept of economic resilience from a decision maker's point of view, is the ability of an economic system to remain in a certain economic regime before reacting to a decision threshold (Sanderson et al, 2017). Economic resilience as the ability of a region to recover successfully from an economic shock. (Hill et al, 2008). Regional resilience as the ability of an area to anticipate, prepare to respond, and recover from disturbances (Simmie and Martin, 2009). Regional resilience as the ability of an area to anticipate, prepare for, respond to, and recover from disturbances (Foster, 2007). The definition of regional economic resilience refers to the idea of the ability of local economic systems to recover from shocks elastically. Urban economic resilience uses four interpretations, resilience to recover from disturbances, recover from disturbances or speed of recovery, ability to absorb disturbances and stabilize system structure and system function capacity to maintain basic performance through adaptation (Martin and Sunley, 2015).

Sanchev et al (2016) define economic resilience as the ability of individuals, communities or countries to reduce vulnerability, to withstand shocks and to recover quickly. Bruneckiene et al (2019) explain that economic resilience

is a series of actions carried out by the socio-economic system to help regions recover from shocks. Xiao et al. (2018) resilient regions are defined as regions that show high entry levels or even increase their entry levels after the shock. Economic resilience is the ability of cities to minimize potential losses due to disasters (Rose and Krausmann, 2013). Bastaminia et al (2017), defines economic resilience as a systematic approach to reduce economic vulnerability and losses and improve critical disaster situations. Foster, (2007), defines regional resilience as the ability of an area to anticipate and recover from disturbances. Palekiene (2015), economies have always been prone to different kinds of shocks, industry shocks, currency crises. Hassan and Othman (2015) analyze the effect of economic resilience on private investment in selected Malaysian economic sectors, the results show that interest rates are statistically significant. Based on the above discussion, the stability of economy system is explained by resistance to disturbance and speed to return to pre-existing equilibrium.

Bruneckiene et al (2018) measures regional resilience to economic shocks, this study is based on 6 capacity groups consisting of 65 indicators using the Pearson correlation coefficient and the Kendall Rank correlation coefficient, from the research results obtained insight capacity index, regional government capacity index, knowledge and innovation capacity index, learning capacity index, infrastructure capacity index.

Research to highlight several aspects that underlie regional resilience and analysis in building a territorial composite index for five factors, namely public relations factors, human structure in urban areas, labor market, economic innovation performance, science and research using principal component analysis was also carried out by Stanickova and Melecky (2018), the results of the study state that the measurement of regional resilience is based on making an index CWIRR (Composite Weighted Index of Regional Resilience for the r th region). The index is formalized as follow:

$$CWIRR_r = \sum_{f=1}^N zw_f F_{f,r} \tag{1}$$

$$\sum_{f=1}^N zw_f = 1, \forall f = 1, 2, \dots, N$$

Research on economic resilience was also carried out by Oliva and Lazzaretto (2018), in this study discussing regional economic resilience in the face of natural disasters by forming a resistance and recovery index for Japan, which was hit by a major earthquake, while the factors studied were regional demographics, economic aspects, labor, innovation and social, using the resistance index and sensitivity index. Resistance index greater than 1 indicates that a region in Japan has relatively high resistance to shocks, on the contrary, if the resistance index is less than 1 it indicates that this region has relatively low resistance to shocks. The author proposes two simple indices in order to evaluate the ability of the regions to resist to recessionary shocks and recovery in a post-recession scenario. The resistance index, or sensitivity index, is calculated as the change in employment in the region compared to the change at national level in the shock period. It helps to understand the ability of a region to cope with a shock. The index is formalized as follow:

$$resistance\ index = \beta_{res} = \frac{(E_{p,t} / E_{p,t-1})}{(E_{w,t} / E_{w,t-1})} \tag{2}$$

$$recovery\ index = \beta_{rec} = \frac{\Delta E_p}{\Delta E_{p,t}} \tag{3}$$

Measurement of national resilience was carried out by the Laboratory for National Security (2015) starting from the measurement of each factor, the results of the measurement of national resilience in the form of a resilience index were scored from 1 to 5, a score of 1 reflects vulnerability, a score of 2 reflects less resilience, a score of 3 reflects quite resilience, a score 4 reflects tough, score 5 reflects very tough. The weight of the indicators for each variable is given according to the priority scale of each indicator, as well as for the weight of each factor.

$$Tannas\ Index = a_1 (demographic\ gatra\ index) + a_2 (natural\ resources\ gatra\ index) + a_3 (ideological\ gatra\ index) + a_4 (ideological\ gatra\ index) + a_5 (political\ gatra\ index) + a_6 (economic\ gatra\ index) + a_7 (socio-cultural\ gatra\ index)$$

$$+ a_8 (\text{security defense gatra index}) \quad (4)$$

Bakhtiari and Sajjadih (2018), have conducted research on the economic resilience index applied to developing countries including Iran involving dimensions of macroeconomic stability, market efficiency, governance, human development indicators, producing macroeconomic stability index, efficiency market index, government index, index human development indicators. Pietroa et al, (2020) Analyzing European Union resilience based on regional vulnerability, resistance and recoverability using resistance index, recovery index, regression method, the result of the analysis is that the response area in receiving external disturbances varies widely. Research conducted by Li et al (2019) analyzed the regional economic resilience of Liaoning province in China, explored the determinants of regional economic resilience using a spatial econometric model on panel data, the results of the analysis were that the level of regional economic resilience in Liaoning was low and the urban economy was vulnerable to external shocks, governance regulatory factors, regional innovation capability and the level of economic diversification have a significant positive effect on regional economic resilience. Ringwood et al (2008) measures regional economic resilience to the great recession in United States of American.

Giannakis and Bruggeman (2019) doing temporal empirical exploration and spatial patterns of economic resilience between European and urban, middle and rural areas the significance of territorial and structural factors during economic downturn. Abdullah and Hassan (2018) measure the resilience of ASEAN - 5 countries country from an economic stability perspective. Reggiani et al (2016) analyze the relationship between resilience and regional strategy using the Resilience Capacity Index (RCI), The result of the analysis is the economic vulnerability of the region in Slovakia is due to the increase in unemployment of the population who lost their jobs as a result of the crisis. Research on economic resilience has been carried out by Simmie and Martin (2010), in examining the definition of economic resilience, analyzing the long-term development of urban and regional economic resilience using an adaptive cycle model. Research to measure the economic resilience index is based on four aspects, namely macroeconomic stability, microeconomic market efficiency, governance, and social development using the simple average method also developed by Briguglio (2008). Foster (2011) that transferred the concept of resilience into the regionalization science analysed regional resilience to economic shocks through the response of the regional economic system to the economic shock in order to maintain a continuous development of the region's economy.

Research to measure the economic resilience index is based on four aspects, namely macroeconomic stability, microeconomic market efficiency, governance, and social development using the simple average also developed by Briguglio et al (2006). Research on economic resilience and recovery from disasters in Wenchuan in 2008 using the Computable General Equilibrium concluded that accelerating the rate of recovery would significantly reduce gross domestic product losses carried out by Xie et al (2018). Empirical analysis of the relationship between regional innovation capacity and crisis resilience in the European region using cluster analysis concludes that the regions least able to respond to the economic crisis have the lowest level of economic capacity (Bristow and Healy, 2017). Research on the economic crisis in the labor sector using the Shannon entropy measure and Tsallis entropy concluded that the entropy measure is an indicator of resilience (Martin et al, 2018).

The results of economic resilience research using the Resilience Capacity Index method show that the regional economic vulnerability in Slovakia is caused by increased unemployment in people who have lost their jobs as a result of the crisis (Reggiani et al, 2016). Dormady et al (2018) conducted comprehensive research on economic resilience using the Kuhn-Tucker formulation. Research to measure and compare the dimensions of social and economic resilience in the Bam and Rudbar areas has been conducted by Bastaminia et al (2017).

3. Methods

This paper uses a bibliometric analysis or method which is also called scientometrics, which is part of the research evaluation methodology from various literature that has been widely produced, and allows bibliometric analysis using a separate method (Ellegaard & Wallin, 2015). The bibliometric method is a method of measuring the literature using a statistical approach so that it includes the application of quantitative analysis (Reuters, 2008). Research using the bibliometric method can reveal the fact that there are very few research results that are not cited after several years, given that citations reflect the impact of the research that has been carried out, (Gracia, Lopez, 2019). Research using the bibliometric method, the scope of which can analyze parts or topics of the bibliography (metadata), including analyzing citations, publication trends, author collaboration, agency collaboration, title trend terms, abstract trend terms, author keywords trend terms, and journals as well as publicist (De Bellis, 2009; Pandu, 2012). Bibliometric mapping will benefit both the scientific community and the general public because it can help transform publication metadata into a map or visualization that is easier to manage and process in order to gain more useful insights, for example visualizing keywords to identify research themes or clusters in a particular discipline. ,

mapping authors from specific journals to identify the geographic scope of authors and journals, and mapping institutional and international collaborations as part of a framework for identifying emerging technologies. Bibliometric analysis consists of four steps, namely the search stage, the filtering stage, checking bibliometric attributes, and bibliometric analysis (Julia et al., 2020a, 2020b).

Software publish or perish used to browse scientific journals is a freeware software to create maps based on selected data and visualize it in map form (Naukkarinen & Bragge, 2016). VOSviewer was developed to view bibliometric maps (Eck & Waltman, 2009). VOSviewer is used to perform bibliometric analysis and visualize analysis results. The results of the analysis provide information that research on economic resilience that has been carried out by previous researchers. VOSviewer was utilized since it is efficient to use with huge sets of data and gives various interesting visuals, analysis, and investigations (Eck & Waltman, 2010). Bibliometric analysis consists of four steps:

1. Search stage.

The software used in tracing scientific journals is publish or perish to search for bibliographies as the initial database. The database sources used for searching on publish or perish is google scholar, science direct, and dimension. Bibliographic searches in this study are limited to several aspects, the type of bibliography used in the types of journals, articles, and conference papers, the author's keywords are used namely economic resilience, the search year for this study was limited to 6 years in 2015-2020.

2. Bibliographic Selection Stage.

This selection is carried out to sort or select the journals, articles, and conference papers to be analyzed. Bibliography that is selected and used is the type of journals, articles, and conference papers.

3. Bibliographic Attribute Stage.

Applications for analysis are included in the bibliographic file Mendeley_02.ris, to analyzing the filtered bibliography, the bibliographic metadata was thoroughly examined. The examination includes the author's name, article title, author keywords, abstract, year, volume, issue number, page, affiliation, country, number of citations, link articles, and publisher. After the metadata is complete, bibliometric analysis begins. The following is a bibliography view of the Mendeley application.

4. Bibliometric Analysis Stage.

Bibliometric analysis is carried out based on seven aspects, namely the formulation of the problem posed. To help carry out bibliometric analysis and visualize the results of the analysis, the application used is VOSviewer. VOSviewer is used because it is good and efficient with a large index of information and can provide a wide variety of interesting visuals, checks, and investigations.

4. Data Collection

Data collection was obtained from google scholar, science direct, and dimension through bibliometric analysis, namely the author, the title of the paper, the title of the journal, the year of publication from 2015 to 2020.

The bibliography reaches were limited to the following aspects: the type of bibliography was only journals, articles, and conference papers, the title and author keywords were two words namely economic resilience and disturbance, the year is limited to 2015-2020.

5. Results and Discussion

5.1 Numerical Results

From the publish or perish search results, it was obtained 999 paper titles from google scholar, 71 paper titles from science direct, 96 paper titles from dimension are related to the search for economic resilience. Then refinement is carried out with keywords economic resilience and disturbance to 336 titles papers from google scholar, 2 paper titles from science direct, 5 paper titles from dimension are related to the search for economic resilience and disturbance. Then merged to obtain as many as 343 paper titles.

The database sources for google scholar was obtained 285 paper titles related to the search for economic resilience and disturbance. The result are shows that publication years are from 2015 to 2020, the number of citation years obtained from the results of citations by authors from 2015 to 2020 is 6 years, the number of papers published in journals are 285 papers, the number of citations is 8177 citations, cites/ year as many as 1362.83 obtained from the total number of citations divided by 6 years of publication is 28.69 cites / paper obtained from the total number of citations divided by the number of papers, authors/papers of 2.76, the authors have an h-index of 46 meaning that each published article is 46 has been quoted at least 46 times, the g-index is described from the accumulation of

papers quoted from the number that affects other papers is 83. The publish or perish application can be used to find out the citation number of articles in journals with data sources from google scholar.

Table 1. Display of Publish or Perish for Google Scholar index based 285 papers

Metric	Score
Publication years	2015 – 2020
Citation years	6(2015-2021)
Papers	285
Citations	8177
Cites/year	1362.83
Cites/paper	28.69
Authors/paper	2.76
h-index	46
g-index	83

This selection stage is carried out to sort or select the journals to be analyzed. Bibliography that is selected and used is the type of journal articles and conference papers. Initial search results through the Publish or Perish application resulted in 285 papers selected bibliographies authors for analysis. The refined results are then exported to Mendeley to make it easier to refered.

Table 2. Display of article refinement results that have been exported to mendeley for 285 papers

Cites	Per year	Rank	Authors	Title	Year	Publication	Publisher	Type
h 49	49.00	48	E Conz, G Magnani	A dynamic perspective on the resil...	2020	European Management Jo...	Elsevier	
1	1.00	211	F Aslani, KA Hossei...	A framework for earthquake resilie...	2020	... journal of disaster resilie...	emerald.com	
h 51	25.50	165	NUI Hossain, R Jara...	A framework for modeling and as...	2019	International Journal of ...	Elsevier	
4	4.00	187	OA Adebimpe, DG ...	A fuzzy-analytic hierarchy process ...	2020	International Journal of ...	emerald.com	
8	4.00	244	S Aggarwal, MK Sri...	A grey-based DEMATEL model for...	2019	International Journal of Qu...	emerald.com	
h 122	24.40	49	DK Yoon, JÉ Kang, ...	A measurement of community dis...	2016	Journal of Environmental P...	Taylor & Francis	
3	1.50	246	F Cubillo, Á Martín...	A metric approach to measure resi...	2019	Journal of Applied Water ...	Taylor & Francis	
26	5.20	146	M Morisse, C Ingram	A mixed blessing: Resilience in the ...	2016	JISTEM-Journal of Informat...	SciELO Brasil	HTML
3	0.75	253	R Bowman, A New...	A model to improve preparedness...	2017	Journal of business contin...	ingentaconnect.com	
h 73	36.50	54	M Moghadas, A As...	A multi-criteria approach for asses...	2019	... journal of disaster risk ...	Elsevier	HTML
17	2.83	61	J Matzenberger, N...	A novel approach to assess resilie...	2015	International Journal of ...	emerald.com	
1	1.00	12	D Chacon-Hurtado...	A proposed framework for the inc...	2020	Journal of ...	ascellibrary.org	
2	2.00	276	S Arabi, M Golabch...	A Qualitative Approach Towards t...	2020	... Ontology International J...	soj.qiau.ac.ir	
7	1.40	263	K Ali, RM Bajrachar...	A review of flood risk assessment	2016	International Journal of ...	old.ku.edu.np	PDF
h 505	101.00	105	M Kamalahmadi, M...	A review of the literature on the pr...	2016	... Journal of Production Ec...	Elsevier	
h 91	22.75	84	E Roberts, BA Ande...	A review of the rural-digital policy ...	2017	Journal of Rural Studies	Elsevier	HTML
41	20.50	155	C Zhang, J Fu, Z Pu...	A study of the petroleum trade ne...	2019	Journal of Cleaner Producti...	Elsevier	

Tabel 3. Display of article refinement results that have been exported to Mendeley for 285 papers

Authors	Title	Year	Published In	Added
	Local Systems: A Commentary On Th...		Journal of...	
Gilloli, G; Tikubet, G; Herren, H R; ...	Assessment of social-ecological transitions in a peri-urban Ethiopian fa...	2015	Internatio...	Sep 10
Bastaminia, A; Rezaei, M R; Sarae...	Evaluating the components of social and economic resilience: After two large e...	2017	... : Journal of Disaste...	Jun 2
Hamill, N	Strengthening urban resilience: The case for Maharishi Vedic Architecture	2020	Journal of Maharishi ...	Sep 10
Rakotoarivelo, O M; ...	On the Dynamic of Country Development	2019	Journal of ...	Jun 2
Gligor, D; Gligor, N; Holcomb, M; ...	Distinguishing between the concepts of supply chain agility and resilience: A ...	2019	The Internatio...	Sep 10
Giannocco, I; Iftikhar, A	Mitigating ripple effect in supply networks: the effect of trust and topol...	2020	... Journal of Produc...	Sep 10
Pajouh, H Danesh; Alipouri, E	Explanation of Morphological Approach to Urban Form in Resilience Thinking	2020	Journal of Urban Ma...	Sep 10
Racca, P; Casarin, R; Squazzoni, F; D...	Resilience of an online financial community to market uncertainty shoc...	2016	Journal of computati...	Sep 10
Qasim, S; Qasim, M; Shrestha, R P; ...	Community resilience to flood hazards in Khyber Pukhthunkhwa province of ...	2016	Internatio...	Mar 18
Korber, S; McNaughton, R B	Resilience and entrepreneurship: a systematic literature review	2017	... Journal of Entrepr...	Jun 2
Oladokun, V O; Proverbs, D G; La...	Measuring flood resilience: A fuzzy logic approach	2017	Internatio...	Mar 18
Wendiro, D; Wacoo, A P; Wise, G	Identifying indigenous practices for cultivation of wild saprophytic mushro...	2019	Journal of ...	Sep 10
Munoz, A; Dunbar, M	On the quantification of operational supply chain resilience	2015	Internatio...	Feb 27

Applications for analysis are included in the bibliographic file Mendeley 02.ris. To analyzing the filtered bibliography, the bibliographic metadata was thoroughly examined. The examination includes the author's name, article title, author keywords, abstract, year, volume, issue number, page, affiliation, country, number of citations, link articles, and publisher. After the metadata is complete, bibliometric analysis begins. The following is a bibliography view of the Mendeley application. Tabel 3 provides display of article refinement results that have been exported to Mendeley for 285 papers.

5.2 Graphical Results

Bibliometric analysis is carried out based on seven aspects, namely the formulation of the problem posed. To help carry out bibliometric analysis and visualize the results of the analysis, the application used is VOSviewer. VOSviewer is used because it is good and efficient with a large index of information. Of the minimum number of occurrences of 4 term out of 2159 terms, 83 meets the threshold. For each of the 83 terms, a relevance score will be calculated. Based on these scores, the most relevant term will be selected. Results of the network visualization terms in the title of economic resilience and disturbance are 285 papers which are presented in Figure 1.

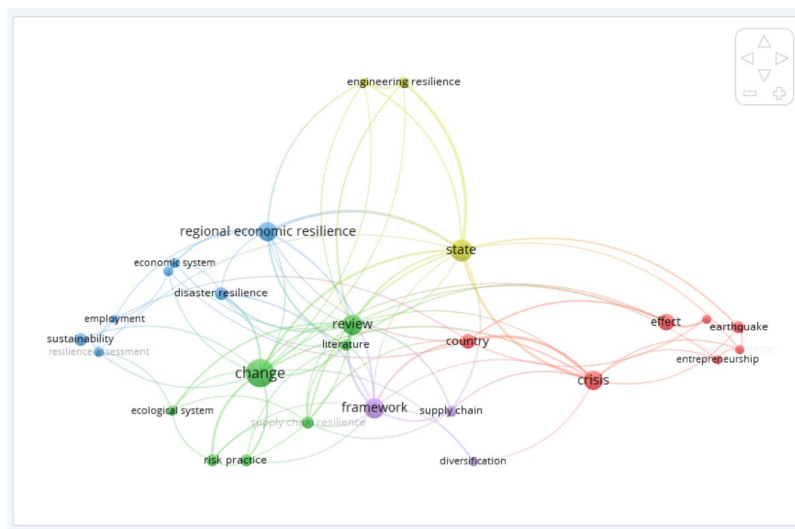


Figure 1. Network visualization terms in the title of economic resilience and disturbance

Network visualization is used to see the network between visualized items. Figure 1 shows the results of the network visualization produced by 5 clusters. Cluster 1 (red) consists of crisis, disturbance, natural disaster, cluster 2 (green) consists of supply chain resilience, risk, ecological system, cluster 3 (blue) consists of disaster resistance, external disturbance, economic system, regional economic resilience, sustainability, cluster 4 (yellow) consists of engineering resilience, resistance, cluster 5 (violet) consists supply chain, diversification. Network visualization that is directly related to economic resilience is external disturbance, disaster resilience, resistance.

Figure 2 shows overlay visualization terms in the title of economic resilience and disturbance in 2015-2020.

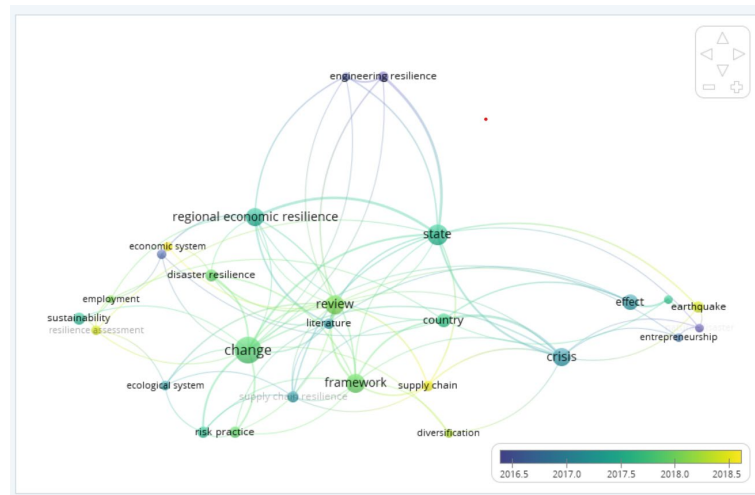


Figure 2. overlay visualization terms in the title of economic resilience and disturbance in 2015-2020.

The documents publication characterized the most significant authors, as well as another set-top authors whose document were most potent in Figure 3. Minimum number of documents of an author is 2, of the 678 authors, 35 meet threshold. Number of authors to be select are 35, 4 authors had a strong association.

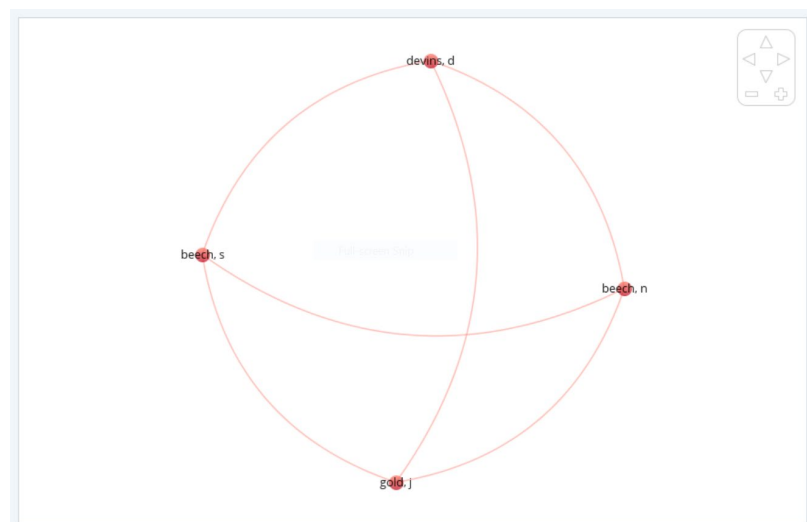


Figure 3 Network Visualization authors

The documents publication characterized the most significant 5 authors show in Table 4.

Table 4. Prominent authors by documents

Rank	Author by Document	Document
1	Bastaminia	3
2	Rezaei	3
3	Skerratt	3
4	Conz	3
5	Zhang	3

Density visualization can be used to see parts of research that are still rarely done. Density visualization is used to see the depth of publication of research results. The lightest color indicates that related topics are widely used in research titles related to economic resilience, on the contrary, light colors indicate that related topics have a great opportunity to be researched. Based on the density visualization map, there are not many researches on the topic of economic resilience for the topic of resistance assessment, disaster resilience, disturbance, supply chain resilience, external disturbance, so there are still opportunities for research.

The results of the analysis provide information that research on economic resilience that has been carried out by previous researchers, examines the economic resilience index which is a number, the economic resilience index is not the only appropriate tool to determine the economic resilience of a city, because the index cannot know the specifications of disturbances and their intensity. Economic resilience must be placed in the context of the control model. Economic resilience implies unwanted conditions and disturbance levels.

5.3 Proposed Improvements

Based on the results of the analysis, a new methodology is needed in assessing the level of economic resilience at the city level that takes into account the interrelation between three types of variables, namely disturbance variable, control variable, and concern variable.

6. Conclusion

The results of the network visualization produced by 5 clusters. Cluster 1 (red) consists of disturbance, natural disaster, crisis, cluster 2 (green) consists of supply chane resisten, risk, ecological system, cluster 3 (blue) consists of disaster resistance, external disturbance, economic system, regional economic resilience, sustainability, cluster 4 (yellow) consists of engineering resilience, resistance, cluster 5 (violet) consists supply chain, diversification. Network visualization that is directly related to economic resilience is external disturbance, disaster resilience, resistance. Prominent 5 authors by documents are Bastaminia, Rezaei, Skerratt, Conz, Zhang (3 documents).

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