On the economic impacts of COVID-19: A text mining literature analysis

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Abstract
The COVID-19 outbreak has affected everyday lives worldwide. As governments started to implement confinement and business closure measures, the economic impact was felt by entire societies immediately. The urgency of such a theme has led researchers to study the phenomenon. Accordingly, the purpose of this research is to provide the state of the art on relevant dimensions and hot topics of research to understand the economic impacts of COVID-19. In this survey, we conduct a text mining analysis of 301 articles published during 2020 which analyzed such economic impacts. By defining a set of relevant dimensions grounded on existing literature, we were able to extract a set of coherent topics that aggregate the collected articles, characterized by the predominance of a few sets of dimensions. We found that the impact on “financial markets” was widely studied, especially in relation to Asia. Next, we found a more diverse range of themes analyzed in Europe, from “government measures” to “macroeconomic variables.” We also discovered that America has not received the same degree of attention, and “institutions,” “Africa,” or “other pandemics” were studied less. We anticipate that future research will proliferate focusing on several themes, from environmental issues to the effectiveness of government measures.

KEYWORDS
coronavirus outbreak, COVID-19 pandemic, economic impact, literature analysis, text mining
1 | INTRODUCTION

The outbreak of COVID-19 and its quick proliferation across the globe has changed daily life routines, causing unexpected and severe impacts in all sectors of the world economy. This pandemic resulted in a global recession, and its extensiveness is comparable only to the two world wars and the Great Depression (Susskind & Vines, 2020). It is estimated that real gross domestic product (GDP) worldwide declined 4.3% in 2020 and, while the forecast for 2021 shows an increase of 4.0% (World Bank, 2021), there is significant uncertainty about economic recovery.

To limit the quick spread of the pandemic in a context of uncertainty and concern, governments have enacted harsh containment measures (Piccinelli, Moro, & Rita, 2021). The main goal was to avoid overwhelming healthcare systems by flattening the growing curve of infections to reduce both the number of infected people and fatalities, holding back for the development of viable vaccines and treatments (Thunström, Newbold, Finnoff, Ashworth, & Shogren, 2020). The lack of knowledge led to unorganized implementation of several different governmental policies with different levels of restrictions to cope with peaks and troughs of infected citizens over time (Sharma, Talan, & Jain, 2020). Those policies include limiting citizens’ mobility by requiring social distancing, lockdowns or business closures, and health measures such as diagnostic tests and quarantine for infected citizens. Containment measures are, on the one hand, crucial to halt the spread of the COVID-19 disease; however, on the other hand, those measures have large economic costs in the short-run. The coronavirus outbreak affected the world economy severely by increasing unemployment and decreasing GDP, stock prices, and interest rates (Barro, Ursúa, & Weng, 2020), with the containment measures resulting in a deceleration of the economic activity in multiple sectors, such as industrial production, trade, or tourism (Deb, Furceri, Ostry, & Tawk, 2020).

At this stage, after more than 2 years since the World Health Organization declared the pandemic, it is very important to ascertain the economic impacts of COVID-19. Although this is a novel topic, its importance already resulted in a significant body of literature, which is deemed relevant to assess and take a first insightful view of scholars’ perspectives on the economic impact of the pandemic. Such trends can be observed in other fields where literature analyses are already being published, such as in supply chain management (e.g., Magableh, 2021; Queiroz, Ivanov, Dolgui, & Wamba, 2020). Following on this vein, our study conducts a literature analysis to determine the state of the art in the field of economics. We conduct a semi-automated literature analysis of 301 published studies on the economic impact of COVID-19 by using a text mining and topic modeling approach (Moro, Pires, Rita, & Cortez, 2019) to understand the hot research topics, future paths of research, as well as the emphasis of most recent and prominent works relatively on economic variables, economic impacts, regions, institutions, and economic modeling (see, among others, Barrero, Bloom, & Davis, 2020; Eichenbaum, Rebelo, & Trabandt, 2020; Sharma et al., 2020). Accordingly, this paper contributes to the existing literature concerning the economic impacts of COVID-19 in the following ways: (1) given the recent focus on determining such economic impacts, a set of papers focusing on this thematic are queried and extracted through an automatic method, allowing to scrutinize a large number of papers and also to provide a first perspective on academic production trends, (2) since those papers are classified on a range
of coherent topics, we discuss the several dimensions that have been analyzed in the literature, determining how they are connected among each other and their importance, and (3) to identify and interpret the most prominent lines of research in the short-run, patterns of investigation, as well as upcoming research avenues.

This article is organized as follows. Section 2 is dedicated to reviewing the relevant literature on the addressed topic. In Section 3, the methodological approach is detailed. Section 4 is focused on reporting the results, including a critical discussion of the findings in light of existing knowledge. Finally, in Section 5, the theoretical and practical implications are drawn, and future research avenues are highlighted.

2 LITERATURE REVIEW

The issue of economic impacts of COVID-19 in a sense of literature review, which is the focus of our work, has not yet been addressed through an automated approach that can extract major research trends and hot topics using text mining techniques. A broader picture of this thematic, as well as the identification and analyses of the relevant fields of research until now and the connectedness among them, is provided. Brodeur, Gray, Islam, and Bhuiyan (2021), through a manual selection of studies, made a literature review analyzing dimensions like measurement of virus spread, social distancing actions, macroeconomic issues, and socioeconomic consequences of the current pandemic. Callegari and Feder (2022) conducted a literature review on the long-term economic effects of different pandemics on development, including COVID-19, underlining effects on innovation, human and physical capital, using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method. Studies addressing literature reviews about other disruptive events with severe effects on economy like terrorism were performed by Krajnák (2021) and Akça and Ela (2017) or natural disasters by Botzen, Deschenes, and Sanders (2019). However, to the best of our knowledge, some studies analyze such dimensions of COVID-19 impacts from different perspectives. The relevance of effects of COVID-19 on economy has justified the production of research from several scopes, and literature generally agrees that the coronavirus pandemic generates significant negative economic impacts. From a macroeconomic viewpoint, several studies quantify such impacts, like Barro et al. (2020), Jordà, Singh, and Taylor (2020), Altig et al. (2020), Walmsley, Rose, and Wei (2021) or Zhao (2020). Eichenbaum et al. (2020) and Jones, Philippon, and Venkateswaran (2020) focus on macroeconomic effects of the pandemic and provide several frameworks, remarking the trade-off between health and economic outcomes. Chudik, Mohaddes, Pesaran, Raissi, and Rebucci (2020) explore the global macroeconomic effects of COVID-19 in several countries, using an econometric model, concluding that the pandemic can lead to a decline in worldwide GDP, however with different impacts across regions. Ginsburgh, Magerman, and Natali (2021) also mentioned the issue of regional inequality of impacts on economy, and Meinen, Serafini, and Papagalli (2021) addressed the different regional economic impacts of pandemic and their heterogeneity on labor market. The topic of unemployment and labor market effects on Euro Area countries is focused by Anderton et al. (2020) and on Germany is focused by Bauer and Weber (2021). Several works underline the relation between economic impacts of the pandemic, government measures, and macroeconomic variables. Faria e Castro (2021) analyzes the effects of coronavirus outbreak on the United States economy, through an econometric model, relating fiscal policies, public debt, household income, and unemployment. Also, Lee, Liao, Seo, and Shin (2020) investigate the effects of fiscal multipliers on the United States economy. Auray and
Eyquem (2020) discuss the effects of lockdown on Euro Area economy on inflation and unemployment, as well as government spending and unemployment insurance. Connecting with the dimension of economic activities, Barrero et al. (2020) examine the relation among firm-level employment, layoffs, public subsidies, and regulatory barriers. Coibion, Gorodnichenki, and Weber (2020) highlight the effects of government measures, like lockdowns, on macroeconomic variables, businesses, and labor market. Baker, Farrokhnia, Meyer, Pagel, and Yannelis (2020) explore how the pandemic changes household consumption and impacts several economic activities.

Given the great uncertainty in financial markets and economies, during the current pandemic, several studies consider such dimension. Gormsen and Kojien (2020) highlight such dynamics during COVID-19, namely in futures, stock markets, and bond markets; Baker, Bloom, Davis, and Terry (2020) on stock market volatility; Alfaro, Chari, Greenland, and Schott (2020) on stock returns in United States; and Ramelli and Wagner (2020) on stock prices. Linking this thematic with other financial crises, Umar, Kenourgios, and Papathanasiou (2020) state that investments in equity indices are sensitive to economic shocks and find patterns between the coronavirus pandemic and other financial crises, like the European sovereign debt crisis and the Greek crisis. Chang, McAleer, and Wang (2020) compare the behavior of stock market investors during Global Financial Crisis that started in 2007, previous coronavirus crisis of 2003, and current COVID-19 situation. Shehzad, Xiaoxing, and Kazouz (2020) compare, through an econometric model, the volatility of United States, Germany, and Italy’s stock markets during Global Financial Crisis and COVID-19. This issue is also approached with commodities prices, comparing with oil crash in 2014 (Gharib, Mefteh-Wali, & Jabeur, 2021) and Global Financial Crisis and Turkish currency crisis in 2018 (Sumer & Ozorhon, 2021), both using Granger causality tests. The issues of financial and monetary economics are also addressed on the COVID-19 framework. Emphasis on currencies is given by Ciner (2021) and Narayan, Devpura, and Wang (2020), and cryptocurrencies are also mentioned by Chiu, Hung, and Liang (2020) and Corbet, Hou, Hu, Larkin, and Oxley (2020). On the role of monetary policies, their effectiveness is analyzed through monetary stimulus (Feldkircher, Huber, & Pfarrhofer, 2021), also focusing specifically on quantitative easing (Rebucci, Hartley, & Jiménez, 2020; Zhang, Hu, & Ji, 2020; Bhar & Malliaris, 2021) and helicopter money (Chakraborty & Thomas, 2020; Drescher, Fessler, & Lindner, 2020). The importance of funding economies, through credit provision and liquidity access on markets, is also underlined by various authors. Some works consider several countries, while others focus on specific countries, such as Funke and Tsang (2020) on China, Debelle (2020) on Australia, Eichenauer and Sturm (2020) on Switzerland, Pappas and Kostakis (2020) on Euro Area countries, Ozili (2022) on several African countries, and Nakatani (2020) on numerous countries. Besides governments, other several institutions play an important role in management of pandemic economic effects. Mazumder (2020) analyzes the financial market reactions to the Federal Reserve of United States (FED) messages; Debelle (2020) and Bhar and Malliaris (2021) also focus on importance of central banks. The relevance of Organisation for Economic Cooperation and Development (OECD), International Monetary Fund (IMF), and World Bank projections on government policies is evaluated by Konig and Winkler (2020) and the announcements of World Health Organization’s by Maneenop and Kotcharin (2020).

Many studies reported a relevant connection between economic and non-economic impacts of COVID-19. The measures implemented by governments to contain the pandemic, such as lockdowns, led to a reduction in peoples’ mobility and, therefore, had impacts on the environment and migration. Such non-economic impacts are likewise approached by researchers such
as Lahcen et al. (2020), who assess the reduction in CO₂ emissions in Belgium; also, Malliet, Reynès, Landa, Hamdi-Cherif, and Saussay (2020) analyze such reduction in France; Helm (2020) with a broad view on environmental impacts. Furthermore, migration, waste management, and wildlife are discussed by Rupani et al. (2020).

Comparing the current with previous pandemics, Alfaro et al. (2020) find a similar pattern on stock returns in Hong Kong during SARS outbreak in 2003 relating to those during the COVID-19 outbreak in the United States; Jordà et al. (2020) address the economic effects of several pandemics throughout centuries in different European countries; Barro et al. (2020) use data from the Spanish Flu to make a parallelism with COVID-19 economic impact. Nevertheless, the current context cannot be directly comparable to previous health crises. Since the SARS outbreak in 2003, the world has overcome a global financial crisis that shattered economies worldwide.

Figure 1 highlights the dimensions influenced by COVID-19, which have previously been mentioned in this section, making clear the relationship of each one with the pandemic and also the connection among several of them.

The urgency of assessing COVID-19 impacts has resulted in many already published studies that form a significant body of knowledge worthy of being scrutinized. Moreover, such large sets of studies can be analyzed using semi-automated techniques that can convert qualitative information in written text into quantitative models using text mining approaches. For example, Anwar, Zhou, Asmi, Wang, and Hammad (2019) performed a bibliometric analysis of more than 27,000 references by plotting a network of related concepts. Muñoz-Leiva, Rodríguez-López, Lièbana-Cabanillas, and Moro (2021) have also analyzed a large body of knowledge using co-word analysis and topic modeling. Therefore, we also adopt a text mining and topic modeling approach similar to the one followed by Santos, Laureano, and Moro (2020).

3 | METHOD

Scientific literature undergoes a peer-review process to ensure the quality of the published articles. Then, it is indexed in databases that typically use three main sections for indexation and the corresponding searching purposes: the title, the abstract, and a set of keywords. Arguably, two of the most widely accepted and disseminated databases are Web of Science and Scopus (Cortez, Moro, Rita, King, & Hall, 2018). While the former is older, the latter has the advantage of covering a wider range of outlets (Abrizah, Zainab, Kiran, & Raj, 2013) and, therefore, it has been adopted in several recent studies (e.g., Moro et al., 2019; Truc, Claveau, & Santerre, 2021). Thus, we also chose Scopus. Another advantage of Scopus is that it is a broad scope database, covering topics from all disciplines, including economics, which is the focus of the present research. As an example, Scopus covers all relevant ACM and IEEE peer-reviewed articles (Meho & Rogers, 2008). In addition, its flexible querying system enables to search for composed Boolean expressions. Based on the previous literature review section, we queried Scopus through the following query on November 30, 2020:

PUBYEAR >2019 AND (TITLE-ABS-KEY ((covid-19 OR coronavirus) AND (“economic shock” OR “economic impact of covid-19” OR “monetary policy” OR “monetary policies” OR “macroeconomic policy” OR “macroeconomic policies” OR “macroeconomic impact” OR “labor market impact” OR “labour market impact” OR “general equilibrium” OR “public finance” OR “consumption expenditure” OR “public debt” OR “government debt” OR “trade balance” OR “stock market” OR “foreign trade” OR “stock return” OR “financial market” OR “financial shock” OR “GDP growth”))).
The search produced 313 articles. From these, we found 12 that consisted in editorial notes or letters from the editors, which called to the relevance of understanding the COVID-19 impact but did not report novel contributions to existing literature. Accordingly, these were removed, leaving a total of 301 articles. In addition, a randomly selected sample of 5% (15 articles) from the 301 was manually assessed in relation to its relevance by the two authors (one is an expert in economic impacts, while the other has published peer-reviewed scientific publications on COVID-19 impacts to the society). Our sample-based assessment enabled us to conclude that the gathered body of knowledge is relevant to the underlined topics, deeming our approach as valid for further analysis.

All the reported experiments in this study were conducted using the R statistical tool, which is open source and offers a set of packages for a myriad of data analysis tasks, including text

**FIGURE 1** Main dimensions influenced by COVID-19. *Source: Own elaboration. [Colour figure can be viewed at wileyonlinelibrary.com]*
analysis (Cortez, 2014). Figure 2 shows the approach used in the analysis. Based on existing literature, summarized in Figure 1, we identified the main dimensions for our analysis. Then, we built the first version of a dictionary that enabled to find words related to each dimension on the articles. The dictionary is a needed input to the next step. However, it needs to reflect the dimensions that are mentioned in each article and, for that, it needs to incorporate words or terms combined by more than one word that represent each dimension and are used by authors in their titles, abstracts, and keywords. Thus, we selected a random sample of 20 of the collected articles to assess if each dimension was being correctly captured in those articles. Such a procedure enabled to tune the dictionary by including words commonly used by authors. Table 1 shows six examples of randomly selected related terms, which represent such dimensions and, therefore, the resulting dictionary.

A text mining procedure that consists in computing the frequency of words in each document is then executed. In comparison to a meta-analysis that is solely based on the quantitative results, the text mining uses all the text, enabling it to include concepts and terms referred by the authors that may reveal important insights that can be assessed through a text mining

Figure 2  Steps involved in data mining analysis method. Source: Own elaboration. [Colour figure can be viewed at wileyonlinelibrary.com]
procedure. Such a procedure provides an efficient means for analyzing a large corpus of literature regardless of its size. The output is a document-term matrix, in which each row represents a document and each column represents a term (or word). However, if all words are accounted for, the resulting matrix will be too large because it will contain as many columns as the different (unique) words existing in all documents. In addition, such matrix is usually very sparse as there are many specific words that occur just in one document. To address such an issue, we used the built dictionary to consider only the dimensions highlighted in Table 1 as columns of the document-term matrix, thus replacing all related terms by each dimension and discarding the remaining words (similar to the study by Santos et al., 2020). Figure 3 depicts the representativeness of each dimension in the form of a word cloud, using the values extracted from the document-term matrix.

**TABLE 1** Dictionary used to match similar terms

| Dimension                  | Examples of related terms                                                                 |
|----------------------------|------------------------------------------------------------------------------------------|
| Economic models            | Vector autoregression model; input–output model; logit-probit model; CGE model; dynamic stochastic general equilibrium model; granger causality |
| Financial markets          | Stock markets; corporate bonds; hedge trading; Eurostoxx; FTSE 100; abnormal returns     |
| Financial economics        | Liquidity; credit; funding; loan; financial economic; financing                            |
| Macroeconomic variables    | Gross domestic product; private consumption; exports; public expenditure; industrial production; savings |
| Monetary variables         | Euro; US dollar; yen; cryptocurrencies; bitcoin; quantitative easing                       |
| Commodities                | Oil; gold; silver; crude; ethanol; cotton                                                |
| Other economic crises      | Global Financial Crisis; debt crisis; Great Depression; great recession; banking crisis; crash of 1929 |
| Non-economic impacts       | Carbon emissions; waste management; human mobility; pollution; social disparities; air quality |
| Economic activities        | Agriculture; industrial sector; fishing; manufacturing industry; airline industry; hospitality industry |
| Economic impacts           | Economic fallout; economic recession; bankruptcies; job losses; financial losses; economic recovery |
| Government measures        | Public policies; quarantining policies; support packages; stimulus packages; lockdowns; social distancing |
| Other pandemics            | EBOLA; MERS; SARS; H1N1; Spanish flu; Spanish influenza                                    |
| Institutions               | World Health Organization; European Central Bank; World Bank; European Commission; Organization of Petroleum Exporting Countries; FED |
| Africa                     | Morocco; South Africa; Mozambique; Mauritius; Sudan; Zanzibar                              |
| America                    | United States; Mexico; Brazil; Cuba; Costa Rica; Aruba                                    |
| Asia                       | China; Japan; Thailand; Bangladesh; Maldives; India                                        |
| Antarctica                  | Antartida; Antarctica                                                                       |
| Europe                     | France; United Kingdom; Spain; Italy; Portugal; Croatia                                     |
| Oceania                    | Australia; New Zealand; Papua New Guinea; Cook Islands; Samoa; Solomon Islands             |

*Note: Own elaboration.*
There are several topic modeling techniques, from which the latent Dirichlet allocation (LDA) algorithm is arguably the most popular (Moro et al., 2019) and has been extensively used to analyze a set of articles in different domains (e.g., Ambrosino et al., 2018; Santos et al., 2020). LDA requires as inputs the document-term matrix and a number of topics. To find an optimal number of topics, we used the “ldatuning” package from R statistical tool, following the procedure by Canito, Ramos, Moro, and Rita (2018). Thus, such number was set to seven. The resulting seven topics are therefore characterized by the relevance that each dimension has to the topic, enabling to understand the themes that are addressed in a topic.

4 | RESULTS AND DISCUSSION

In this section, we present the analysis and discussion of the uncovered results. First, we provide a brief overview about journals that have been published under such a thematic. Afterward, we discuss on the computed topics. Our findings enable to gauge about the most recent patterns of research on this thematic and to identify the hot topics. Furthermore, we also discuss on the connection between different topics and dimensions, providing evidence about the lines of research that have received the most attention. However, we underline that this work focuses on the economic impacts of COVID-19 in the short-run, since Scopus was queried at the end of November 2020, as mentioned in the previous section.

4.1 | Source titles

The importance of the COVID-19 impact on the economy is patent on the reputation of journal publications and their impact factor, as well as Scopus ranking. More than half of articles are published in journals ranked in Scopus quartile 1 and 2 and in several influential journals (see Table 2 for the journals contributing with most articles). In comparison, conferences and book chapter publications have received less attention from researchers on these topics. Since high-ranked journals require a thorough screening and peer-review process that can take some months (Huisman & Smits, 2017), we can assume from the large number of published articles that the urgency of the theme was also perceived by editors who may be more willing to speed up the process while maintaining a rigorous peer-review.
4.2 Topic relevance and analysis

In this section, the topics are exhibited, and the subsequent discussion, interpretation, connection, and implications are explained.

Figure 4 presents the seven unveiled topics, one per graphic. In each one of them, the most important dimensions, with word probability above 1% (from the ones identified in Table 1), are shown, with the length of each bar (computed using the β distribution value obtained from LDA) representing the relation to the topic. Such topics intend to demonstrate how the dimensions are aggregated in the selected body of knowledge by our query, allowing to select ones that focus on the economic impacts of COVID-19 and the main relevant dimensions and their connectedness.

A brief overview of topics will be given and then each one of them will be detailed, discussed, and connected with others.

Topic 1 focuses almost exclusively on the dimension “financial markets.” Topic 2 addresses dimensions of “Europe,” “government measures,” and with residual weight “other economic crisis.” Topic 3 reports works predominantly of “economic impacts,” “economic activities,” and “non-economic impacts.” On topic 4, several dimensions are related and more balanced in their

| Source                                           | No. of articles |
|--------------------------------------------------|-----------------|
| Finance Research Letters                         | 26              |
| Journal of Behavioral and Experimental Finance   | 7               |
| Economic Outlook                                 | 7               |
| Sustainability (Switzerland)                     | 6               |
| Emerging Markets Finance and Trade               | 6               |
| Applied Economics Letters                         | 6               |
| Journal of Public Affairs                        | 6               |
| Environmental and Resource Economics             | 5               |
| International Review of Economics and Finance    | 4               |
| Journal of Industrial and Business Economics     | 4               |
| Journal of Asian Finance; Economics and Business | 4               |
| Journal of Public Budgeting; Accounting and Financial Management | 4 |
| Swiss Journal of Economics and Statistics         | 3               |
| International Review of Financial Analysis       | 3               |
| Investment Management and Financial Innovations  | 3               |
| Economics Letters                                | 3               |
| Entropy                                          | 3               |
| Emerald Emerging Markets Case Studies            | 3               |
| Wirtschaftsdienst                                | 3               |
| Journal of Policy Modeling                       | 3               |
| Economics Bulletin                               | 3               |

Note: Own calculation.
importance, focusing on “monetary variables,” “financial economics,” “America,” “institutions,” and “Africa.” Topic 5 highlights works that analyze essentially “financial markets” and “Asia.” Topic 6 emphasizes studies mainly of “macroeconomic variables,” having “financial economics” and “economic models” minor weight. At the end, topic 7 has a more diverse range of dimensions, with “commodities” and “economic models” being connected more strongly and with “other economic crisis,” “other pandemics,” and “economic impacts” having less importance.
The dimension “financial markets” is highlighted on topics 1 and 5. In the first, that dimension constitutes per se the dominant line of research, since both “monetary variables” and “government measures” are residual. In fact, the thematic of financial markets appears to be very important and studied. About 50% of total works considered made an approach in this dimension and more than 6% address it exclusively. Therefore, we can ascertain that there clearly exists an autonomous line of research about the economic impacts of COVID-19 that analyzes financial markets. One of the reasons could be the immediate effects verified on markets, due to restrictions imposed by governments in the pandemic scenario and the turbulence and high volatility observed in stock markets in the face of great uncertainty. Such facts also justify the joint analysis, although residual, with different currencies and government measures. For example, Haroon and Rizvi (2020) highlight the relation of government measures, monitored by the Stringency Index, to flattening the COVID-19 curve and their impact on stock markets. The Stringency Index is part of the tool Oxford COVID-19 Government Response Tracker, such as Economic Support Index or Risk of Openness Index. Such a tool is very important to monitor and compare the evolution of pandemic and policy responses worldwide, useful for policymakers and government responses (Hale et al., 2020).

In topic 5, “financial markets” and “Asia” prevail on analysis, while “monetary variables” and “Africa” are almost insignificant. Indeed, the results suggest that the two main dimensions were studied together several times. About 15% of total works considered “financial markets” and “Asia” together, whereas by aggregating all the other continents, the output is only 17%, with Europe accounting for almost 11%. Undeniably, we can conclude that Asia by itself has an approximately number of works in this dimension that the remaining continents together. This fact cannot be dissociated that pandemic epicenter has started in Asian countries.

Topic 2 emphasizes that much research is focused on a specific region and, in this case, “Europe,” with the dimensions “government measures” and “other economic crises” being related to Europe, especially the former. European countries have a predominance on the set of works considered, with about of 23% of total works mention such dimension. Only Asia is studied in more articles considering the countries, which is discussed when analyzing topic 5. While the other continents are included in specific dimensions, like America in topic 4, the European continent is the most important dimension in this topic. Apart from being one of the most mentioned in the papers, the analysis spectrum is vast, focusing on several different dimensions. This did not happen with Asia, that concentrates more than half of their works on “financial markets” or with America that only represents about 10% of total works. In Europe, “government measures” like quarantining policies or stimulus packages seem to have more predominance in studies in comparison with countries of other continents. Policy coordination within the European Union countries, with recovery packages such as the “European bazooka,” can help in explaining these results. As previously mentioned, the Stringency Index is an important tool to monitor and compare the pandemic evolution and government measures implemented in several different countries, including in Europe. A comparison with the previous economic crises is also mentioned, since some linkages with European sovereign debt crisis can also be unveiled.

The dimension “macroeconomic variables” is predominant in topic 6, in which “financial economics” and “economic models” are also underlined with some importance. The remaining dimensions, “Oceania” and “economic activities,” are immaterial. The impacts of COVID-19 on macroeconomic variables are quite important, considering that the pandemic affects significantly the economic environment and to tease negative impacts, which justifies its prominence, as addressed by Barro et al. (2020) and Eichenbaum et al. (2020), among others. Moreover,
about 35% of total studies mention this dimension, attesting their importance. In fact, the pandemic caused a large disruption on the functioning of the world economy and several macroeconomic variables were severely affected, however in different ways. For instance, a significant contraction of GDP, exports, and private consumption was observed, while public expenditure and savings increased in many countries (e.g., Douglas & Raudla, 2020, for the United States; Kinda, Zidouemba, & Ouedraogo, 2020, for Burkina Faso; Drescher et al., 2020, for several European countries). The slowdown of economies also impacted the dimension “financial economics,” since such deceleration led to a reduction in grant loans and changes in funding and liquidity in economies worldwide. Some researchers started to model the economic impacts of coronavirus, despite the dimension “economic models” does not have up till now large predominance on this topic. This can be explained because the majority of macroeconomic variables are available monthly, and most of economic models used to estimate such impacts require a large number of observations, which are not available yet. Furthermore, it is expected that over time the weight of this dimension will increase and the number of works using different economic models, including econometric models, spread.

Focusing on topic 3, a relationship among “economic impacts,” “economic activities,” and “non-economic impacts” is established, as well as with “Europe” and “Asia,” on a minor scale. About 33% of total works remark the first dimension, and it seems to be very close to the second. Notwithstanding the relevance of economic impacts of COVID-19 across all dimensions, the connection of economic recession, job losses, price spikes, break in productions, bankruptcies, or layoffs directly affects economic activities of all sectors. For instance, the difficulties in transporting raw materials generate delays in production and a decrease in production in many sectors; the business closures were also felt across sectors of activities, from agriculture to manufacturing industry. Moreover, the severity of economic impacts felt by different sociodemographic groups in society was very heterogeneous and some groups were affected more compared to others, conducting to a retrench on their consumption and savings, as well as poverty increase. Such facts will also lead to a deceleration of economic activities in future (Martin, Markhvida, Hallegatte, & Walsh, 2020). While some people maintained their income during pandemic, as office employees who work remotely from home, others suffered a partial or even total reduction in their wages and, therefore, their quality of life decreased. One example is on tourism industry, which was totally paralyzed, and many employees stayed in precarious situations. Since tourism plays a crucial role in economies of some countries and/or regions and consequently in employment, wages, and reduction in regional asymmetries (Andraz, Norte, & Gonçalves, 2016), such groups of individuals were severely affected than others. These issues were addressed in several studies, including those that discuss some non-economic impacts, such as environmental issues, like gas emissions and waste management, associated with several economic activities, such as tourism, construction sector, or shipping. The topic also suggests that such a thematic is mainly focused on Europe and Asia. Perhaps future studies will extend the measurement of these dimensions together, allowing to understand the effects of economy’s slowdown on environment, business, and economy as a whole, analyzing their relation.

Relatively to topic 4, the weight distribution of all dimensions is more balanced and scattered when compared to the remaining topics. Thus, we can conclude that there is a stronger relation among those dimensions, however less concentrated in one or two of them. For instance, in terms of the importance of these dimensions in total works, “monetary variables” accounts for 13%, “financial economics” and “institutions” both with 12%, “America” with 10%, and “Africa” with 5%, approximately, while in other topics such percentage is much higher.
The two main dimensions of this topic can be related to several works, since more than a few terms of both dimensions are complimentary when analyzed. For example, the liquidity available on economies, to provide funding to banks and therefore granting credit to customers, is related to monetary instruments such as quantitative easing and, consequently, those policies are decided by institutions such as central banks. These issues were addressed in Funke and Tsang (2020), among others. FED is an important player who makes worldwide monetary decisions, as well as the IMF and, for that reason, America also plays a decisive role in these matters. From another point of view, the results seem to suggest that studies focusing African countries tend to be more embracing, discussing more dimensions than in other countries (see, for example, Ozili, 2022) and highlighting other institutions, such as the World Health Organization, which plays a key role in supporting many developing countries in Africa.

Concerning topic 7, the results suggest a pattern of studies relating a set of five dimensions, specifically “commodities,” “economic models,” “other economic crises,” “other pandemics,” and “economic impacts.” Once again, similar to topic 4, no one dimension predominates there, but instead there is a linkage among several of them. The first two dimensions have a relevant presence in total studies, with 14% and 25%, respectively, while the next two are more associated with previous situations and are less expressive (7% and 3%, respectively). In this topic, economic modeling has an important role, mainly related to commodities, contrary to topic 6. One explanation is certainly associated with the fact that many commodities present daily data, unlike most of macroeconomic variables and, in this case, frequently a large number of observations are available, and the requirements required to use such models are accomplished. Commodity prices are very sensitive in contexts of uncertainty, and it is very important to estimate their evolution through time. For example, on one hand, gold and palladium can serve as a refuge for investors and their price increases as a result, due to higher demand; on the other hand, as a consequence of the economic slowdown, the demand for crude and aluminum diminishes, and thus there is an increase in stored quantities, leading to a price decrease. In such a scenario, a lot of studies aim to understand the impact of the pandemic on commodities through economic models. More extensively, some authors also connect “commodities” and “economic models” with “other economic crises” (see, for example, Sumer & Ozorhon, 2021), allowing the assessment of the current and previous economic crises. In the same vein, some works intend to predict the economic impacts of the current pandemic and to compare those results with “other economic crises” (e.g., Great Financial Crisis, debt crisis) or “other pandemics” (e.g., H1N1, SARS, Spanish Flu) or, alternatively, estimate economic impacts of previous crises and try to use them as a base for modeling the COVID-19 scenario.

Table 3 shows the distribution of the articles per topic, while also exhibiting an example of an article per each topic for further discussion. Therefore, the study by Corbet et al. (2020) is an example of topic 1, primarily focused on financial markets, as this study addresses the market volatility spillovers effect caused by the pandemic. In topic 2, Cacciapaglia et al. (2020) devoted efforts to study government measures to mitigate the pandemic effects, while the article shown for topic 3 (Mukanjari & Sterner, 2020) is a great example of how the pandemic caused economic impacts on several economic activities and how the recovery can cause non-economic impacts, being more environmental friendly, for several countries. Within topic 4, Mazumder (2020) assessed financial economics using monetary variables by studying FED’s policies (within the United States of America). He et al. (2020) studied the impact of COVID-19 in the Chinese financial market, which is encompassed within topic 5. Umar et al. (2020) adopted a statistical approach to study financial market performance by using macroeconomic variables (topic 6). In topic 7, Chang et al. (2020) focused on the energy (commodity) market.
Specifically, they developed economic models to compare the COVID-19 impact on the energy market with other economic crisis (i.e., the Global Financial Crisis of 2007–2009) and with other pandemics (e.g., the SARS in 2003).

5 | CONCLUSIONS

This study reviews the recent works and reports relevant dimensions and topics of research to understand the economic impacts of COVID-19. The methodology used is based on text mining literature. Such an approach makes it possible to identify and aggregate the most prominent lines of research about this thematic based on the textual contents of published articles, synthesizing and bringing coherence to the existing body of knowledge.

Our study has some limitations that need to be accounted for. First, the dynamics of COVID-19 and the unprecedented pace at which related studies are being published makes our static view in time to become outdated quickly. Second, the use of automated approaches based on text mining, while enabling to efficiently analyze a large body of knowledge, is solely based on matching textual contents, whereas the human language has many subtleties and style figures that are still hardly perceived by advanced text mining techniques.

The results highlight some important findings about the research focusing economic impacts of the novel coronavirus discovered in 2019, from which some conclusions can be drawn and their effects better understood. First, this research area has quickly attracted much attention, and the existing body of literature is already quite significant. In fact, in a few months a large number of articles about this issue were published in several renowned peer-reviewed journals. Second, the focus of the topic analysis is heterogeneous. While there are topics that approach mainly one dimension, such as the case of “financial markets” in topic 1 and “macroeconomic variables” in topic 6, constituting an autonomous line of research, there are other topics where the analysis is scattered by several dimensions, like topics 4 and 7, allowing to identify the strong connection among such dimensions.

Third, there are predominant dimensions when the economic impacts of COVID-19 were analyzed and hot topics were identified. Until now, dimensions that capture the attention of researchers exist, to the detriment of others. We concluded that “financial markets,” “macroeconomic variables,” “Asia,” “economic impacts,” and “Europe” are the top dimensions scrutinized. On the contrary, “other pandemics,” “Oceania,” “Africa,” “institutions,” and “other
economic crises” are scarcely mentioned in the articles. Nevertheless, those continents and the comparison with previous economic and/or pandemic events may gain relevance in the future, with the proliferation of studies.

Fourth, the geographic analysis presents a trend on studies. Asia, where the disease first occurred, is the continent predominantly discussed in many articles, followed by Europe, while Africa and Oceania have little relevance up until now. However, the focus of the continents research does not show a pattern, since Asia is largely associated with one dimension (“financial markets”), while European studies cover several dimensions, from “government measures” to “other economic crises.”

Fifth, dimensions such as “commodities” are already quite studied quantitatively and through economic models to assess economic impacts, whereas “macroeconomic variables” tend to be very commonly used beyond the context of economic impacts. The explanation can be related to data availability, as frequency data of the two dimensions referred are different (the first is mainly daily, while the second is mostly monthly). Over time, it is expected that articles focusing on the measurement of economic impacts of COVID-19 will increase, from a macroeconomic perspective in relation to environmental issues, allowing future articles to link several dimensions with economic modeling.

Sixth, with the likely proliferation of studies in the future and when the economic impacts are better known, more conclusions can be drawn about the effectiveness of government measures to quell the impacts on economies, the role of institutions, and a comparison with the depth of COVID-19 effects with previous crisis, as well as across all the dimensions considered. Moreover, the significant negative economic effects of lockdown policies in the short-run, highlighted by this work, may remain in the future, impacting on long-run economic and social welfare and not only during pandemic.

Seventh, our results can allow researchers to identify an “opportunity window” in future studies focusing economic impacts of COVID-19, since our work presents the state of the art on this issue and summarizes the articles published and research patterns about this thematic. Starting from this short-run analysis, it would be interesting to investigate how dimensions and topics of research change over time, including their connectedness, allowing to understand the path on this thematic research. Will dimensions less scrutinized, like “institutions,” “other pandemics,” and “other economic crisis,” gain importance in future works? On macroeconomic framework, studies approaching the measurement of both short and long-run pandemic impacts on macroeconomic variables plausibly will proliferate, focusing on different regions or countries, through a vast number of models, intending to measure and compare the deepness of such impacts. Another avenue of research can address environmental aspects. On one hand, when economic activities had slowdown, air quality probably improved in the short-run; on the other hand, waste management and environmental concerns may become worse. What is the role of pandemic on this subject and their impact? Concerning impacts on business activities, such as bankruptcy and closures, were public policies effective? Did all the sectors have the same resilience and survival rate? The effectiveness of government measures among countries and their impact on containing both the proliferation of the pandemic and on minimizing the adverse economic impacts can also be addressed, for individuals and businesses. Other questions may be raised. Did financial system have upheavals during the pandemic? Will it be affected in the long-run due to the event? Another line of research can address the comparison of impacts with previous pandemics or economic crisis.
ACKNOWLEDGEMENT
The authors would like to thank the useful comments of the four anonymous referees. The work by Sérgio Moro was supported by the Fundação para a Ciência e Tecnologia (FCT) within the following Projects: UIDB/04466/2020 and UIDP/04466/2020.

DATA AVAILABILITY STATEMENT
The data that support the findings of this study are available from the corresponding author upon reasonable request.

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