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FRANCISCO SÁNCHEZ-CUBO*

University of Castilla-La Mancha

MANUEL VARGAS-VARGAS**

University of Castilla-La Mancha

JOSÉ MONDÉJAR-JIMÉNEZ***

University of Castilla-La Mancha

ELENA LASSO-DELA-VEGA****

University of Málaga

CIRCULAR ECONOMY AND ENVIRONMENTAL BEHAVIOUR: A SYSTEMATIC LITERATURE REVIEW

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* Contact information (corresponding author): francisco.scubo@uclm.es, Department of Political Economy and Public Finance, Economic and Business Statistics and Economic Policy, University of Castilla-La Mancha, Cuenca, Spain, phone: +34926053798; ORCID ID: <https://orcid.org/0000-0002-0556-7239>.

** Contact information (corresponding author): manuel.vargas@uclm.es, Department of Political Economy and Public Finance, Economic and Business Statistics and Economic Policy, University of Castilla-La Mancha, Cuenca, Spain, phone: +34926053396; ORCID ID: <https://orcid.org/0000-0002-9701-8148>.

*** Contact information (corresponding author): jose.mondejar@uclm.es, Department of Political Economy and Public Finance, Economic and Business Statistics and Economic Policy, University of Castilla-La Mancha, Cuenca, Spain, phone: +34969179100; ORCID ID: <https://orcid.org/0000-0001-6161-0214>.

**** Contact information (corresponding author): elenalasso@uma.es, Department of Applied Economics (Economic Structure), University of Málaga, Málaga, Spain, phone: +34952133265; ORCID ID: <https://orcid.org/0000-0003-1967-7946>.

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Abstract: The circular economy is a top priority issue on the European green agenda. However, despite this topic having been studied for decades, there seem to be no clear ideas about how to carry out the strategies and actions that allow achieving the presupposed objectives. For this reason, this paper aims to offer a systematic literature review that might provide researchers with a synthesis paper on what has been studied so far. To achieve that, descriptive and bibliometric analyses were performed on the bibliographic data obtained from the *Web of Science*. That, together with the study of the most prominent extant pieces of work in the field, both historical and present, allow offering a comprehensive picture of the state of arts. Thus, the main conclusions are that there is no clear study trend and, consequently, efforts are dissipating. In addition, the problem of the budget limitation is acknowledged since it might prevent researchers from carrying out solid experiments that may allow finding general solutions to the problems derived from the implementation of circular economy strategies or actions.

■■■ INTRODUCTION

Although the protection of the environment is not a brand-new term, in recent years its presence in the media has kept rising strikingly and it has become a critical element within the European countries and the European Union policies. Such phenomenon gets reinforced due to the forthcoming implementation of the well-known ‘European Green Deal’, which is expected to make Europe climate-neutral by 2050 (European Commission, 2021).

As a result, in almost any field of study, researches are made from a ‘green perspective’. That also applies to the analysis of sustainability and environmental impacts of human activities, which is commonly known as ‘green economy’ (Mondéjar-Jiménez & Vargas-Vargas, 2018). However, this term does not only reside in the production process, but in dealing with individual and collective behaviours which influence environmental issues, that is, there is a social dimension involved in it (Zelezny & Schultz, 2000). Thus, this matter is about ecological constraints within the general economic frame from a behavioural perspective (Leeming, Dwyer, Porter & Cobern, 1993; Cottrell & Graefe, 1997; Bratt, 1999; Kaiser & Shimoda, 1999; Schmuck & Schultz, 2002).

In this regard, academic research has steadily evolved since the issue first appeared at the end of the 1960s. Back then, the main concerns were about the overuse of natural resources (Dunlap & Van Liere, 1978), with a special interest

in analysing how saving energy and raw materials might impact environmental sustainability (Quesada, Villar & Mondéjar, 2011), which is still relevant in developing countries (Raval, Saxena & Thanki, 2021). It meant the questioning of the 'linear economic model', that is, the classic anti-ecological model of extracting, using, and disposing of resources. In line with these first approaches to analysing the environmental impacts of these behaviours, the end of the century was characterised by an increasing concern on developing a wide and comprehensive body of research, including recycling and socio-economic and demographic factors (Berger, 1997). Nevertheless, the proposals in analysing this matter remained still theoretical and conceptual. Lastly, the research carried out at the beginning of the 21st century revolves around the side – but not minor – impacts of the overuse of natural resources. These include not only environmental problems such as global warming and water scarcity (Corral-Verdugo, Bechtel & Fraijo-Sing, 2003), but also derived socio-economic issues, including but not limited to poverty and social inequity. All these problems are grouped together and coin the term 'sustainable development' (Mondéjar, Vargas & Mondéjar, 2010; Segarra, Mondéjar, Peiró & Mondéjar, 2015), which turned into the Agenda 2030, comprising 17 Sustainable Development Goals (United Nations, 2021). However, the analysis of environmental behaviours at the individual level still remains understudied, being outshined by the predominance of macroeconomic research (Daly, 1991).

Currently, these approaches have been surpassed by the concept of 'circular economy', which aims to materialise the prior conceptualisations around sustainable development in a new system that minimises the use and waste of resources (Geissdoerfer, Savaget, Bocken & Hultink, 2017). The academic production in this regard is sizeable, but the foremost outcomes revolve around the importance of changing the business model through innovation to achieve a 'greener' production (Ziółkowska, 2018; Suchek, Fernandes, Kraus, Filser & Sjögrén, 2021).

Thus, the European Commission is committed to taking steps in this line through the 'European Green Deal' action plan to achieve a climate-neutral Europe by 2050. Therefore, there is an extant research line – in many disciplines – that analyses the likely effects of the proposed policies framed within circular economy actions. Nevertheless, the main concern is still about Greenhouse Gases emissions (Janik, Ryszko & Szafraniec, 2020), which is, by far, the most mediatic issue regarding environmentalism. In this sense, it might be highly positive to consider a more widely dimension of 'sustainable development', not

only focusing on reducing emissions but also on heading to a ‘zero emissions’ production system. Regarding this, an in-depth analysis should be promoted to support governmental policies at all territorial levels, including supranational policies.

However, rigorous and robust analyses are crucial to properly develop a sustainable Europe, which bases the policymaking process on science. In this sense, two dimensions ought to be considered. On the one hand, it might be regarded a ‘minor’ scope concerning cities as the ‘minimum unit’ through which circular economy actions could be carried out. This approach considers cities as ecosystems in which the stakeholders are coordinated to achieve this common goal. Notwithstanding, stakeholders usually have different interests, so they behave differently. Therefore, decision-making tools that enhance cooperation between agents – as if it were a Game Theory experiment – is essential to optimise the adoption of circular economy policies (Palafox-Alcantar & Dexter, 2020; Choi, Taleizadeh & Yue, 2020).

On the other hand, a ‘macro’ scope is mandatory, at least at the European level since the European Union is the main actor in promoting the sustainable development of its members. Nevertheless, as it occurs in other many aspects, the EU-28 suffers from a profound desynchronisation between Southern and Northern countries, as well as between ‘new’ and ‘old’ members. Fura, Stec and Mis (2020) proved that for the latter case concerning the level of implementation of the circular economy, finding relevant differences that should be tackled. Consequently, this phenomenon should be studied in-depth, considering the importance of the coordination between the countries to achieve the goal of being climate neutral.

In this context, the importance of the circular economy in the sustainable development of nations, both European and non-European, is obvious. However, even though the issue has been the object of study for decades, the success stories applied at the business or individual level, or any level of governmental administrative management still seem to be far behind. That is why this work aims to be the meeting point for the main ideas and experiences so far, combining the most recent studies with those most relevant from the beginning of the studies on circular economy.

Thus, this section summarised the paths, from the beginning to the present, that the different streams of thought have followed in the sphere of the circular economy. However, the purpose of this work goes further, trying to reveal the

underlying thematic relationships in the literature. For achieving that, the authors relied on bibliometric techniques that, together with the results obtained through the descriptive analysis of the extracted data, compose a realistic and updated image of the state of arts about circular economy. In the second section, the nature of the data, as well as the performed analyses, are explained. Then, the third section shows the results and delves into the review of the extant literature, thanks to the support of the relational maps generated. Finally, the results are discussed, the conclusions are presented, and future lines of research are identified.

RESEARCH METHODOLOGY AND RESEARCH PROCESS

This study employs descriptive and bibliometric analyses to achieve the previously described objectives. The data used in both cases comes from the *Web of Science* database, after systematic filtering of the high volume – and, in many cases, not very representative – of works returned by the search for the term *circular economy*. This filtering aims to retrieve the greater volume of relevant papers generated around the subject without losing sight of the business focus. That is why the articles whose interest is on the technical description of the production processes of a particular product, in the context of achieving the green objectives of the companies, have been excluded.

In light of the above, the designed search equation has two modules. On the one hand, the one related to the key concepts in the literature *green economy* and *circular economy*, previously defined in the introduction of this piece of work. On the other hand, the behavioural component adds both *green behaviour* and *environmental behaviour*. The truncation of the word *Behaviour* is to include both the British and American variants. Likewise, the search was carried out limiting the documents to published scientific articles and *Early Access* ones, in the *Web of Science Core Collection*, and limited to the title, abstract and keyword fields; that is, to *Topic*. This search returned a total of 1,225 results (accessed on 04/12/2021).

(("green" OR "circular") AND "economy") AND (("environment*" OR "green") AND "behavio*r*")

Once the data was retrieved, the proposed analyses were performed. In the first place, the descriptive analysis consists of the graphic representation of the historical evolution of the number of articles published on the subject, indexed in the *Web of Science*. Then, interest shifts to the journals that have published most papers in this regard and their temporal distribution. These analyses offer an overview of the distribution of the documents and support the design of the bibliometric one (Mondéjar-Jiménez, Sánchez-Cubo & Mondéjar-Jiménez, 2022).

As a result of the information extracted from the descriptive analysis, for the execution of the bibliometric analysis, the division of the sample into non-homogeneous time intervals is considered. Thus, the periods are (1) 1948–1999 (14 documents); (2) 2000–2004 (16 documents); (3) 2005–2009 (26 documents); (4) 2010–2014 (90 documents); (5) 2015–2019 (479 documents); and (6) 2020–2022 (600 documents). The software used is *SciMAT* (Cobo, López-Herrera, Herrera-Viedma & Herrera, 2012). It allows performing bibliometric analyses from multiple approaches and offers precise data pre-processing. For this study, the tools used are (1) the *evolution map* of the clusters identified in each established period; (2) the *strategic diagram* – which locates the clusters identified in a matrix according to their density and centrality – that is, their relative relevance in the academic context of the subject analysed (He, 1999; Liu, Goncalves, Ferreira, Xiao, Hosio & Kostakos, 2014); and (3) the networks of the main clusters. The results of these analyses are presented and discussed below.

RESULTS

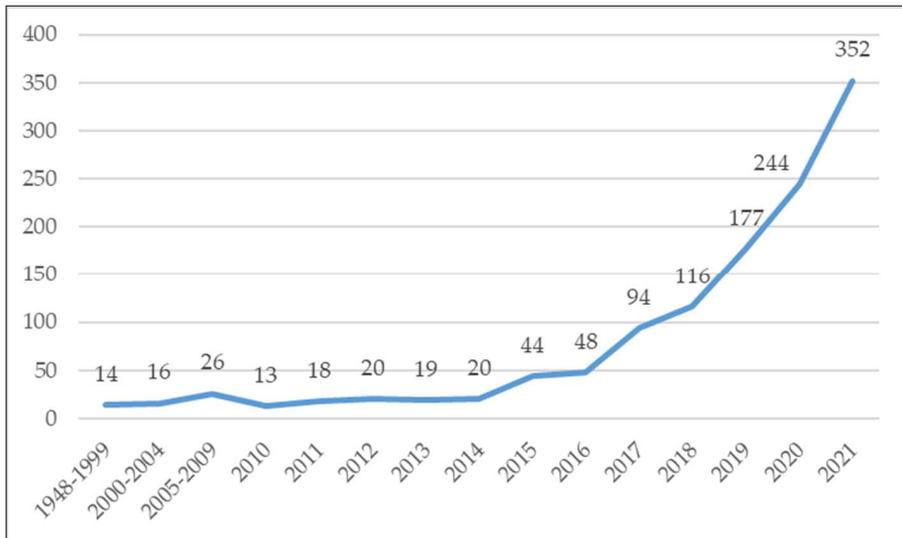
Descriptive results

To begin with, the descriptive results are presented. As previously suggested, the results obtained in this study have gone beyond the mere picture of the data but have been crucial to lay the foundations of the bibliometric study through the division in non-homogeneous time intervals. However, this is not the only relevant information extracted from the descriptive analysis of the data.

In the first place, it is essential to offer a picture of the temporal evolution of scientific publications throughout the entire historical period. That is represented simply in figure 1. In that figure, there is a truncation at the beginning of the series – which match the first three periods described in the *Materials and Methods* section – to simplify the graph. That is because the number of papers in

those years oscillates between zero and three, and there is just a one-time peak of seven articles in 2007. Therefore, it was chosen to introduce such a truncation since the trend in these three periods is virtually horizontal. Besides, the beginning of the rise in interest was in 2015, with an increase of 120% compared to 2014. Later, in 2017, there was another step rising to 96% compared to 2016. Since then, the trend has been exponential until reaching the peak of 352 papers in 2021. As of this study, there are already four articles in *Early Access* dated 2022. All in all, the main conclusion that can be drawn from figure 1 is that despite the many decades of studies about sustainability, green economy, etc., the interest in the circular economy has been in the last seven years.

Figure 1. Number of papers published within the 1948–2021 period

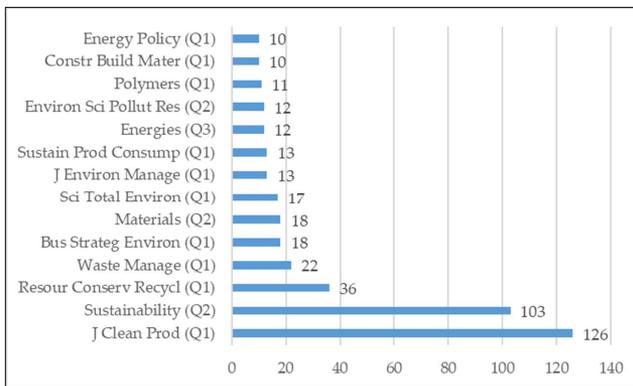


Source: Authors. Data from Web of Science.

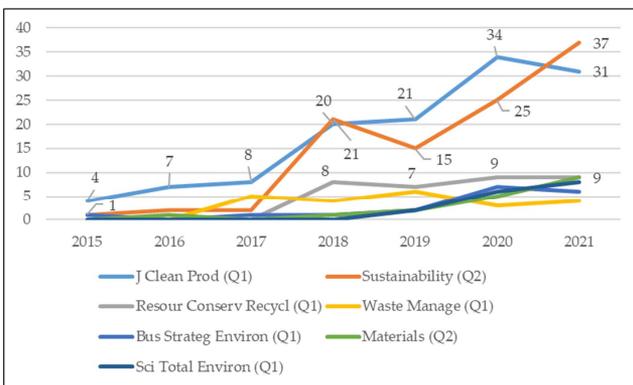
Therefore, to delve into the characteristics of these scientific articles, the graphs contained in Figure 2 have been prepared. On the one hand, those journals having ten or more articles published throughout the period are shown (1948–2021) (figure 2.a). On the other hand, the evolution in the number of papers published by the most relevant journals in the seven-year interval previously highlighted is displayed.

Thus, graph (a) of figure 2 shows two particularly striking data. First, the journals with the most articles published in the field of study are indexed journals, mainly in the first quartile of the *Journal Citation Reports* – 10 out of 14. Second, the two journals with the highest number of articles published count more papers than all the other journals combined. This figure is striking insofar as it cannot be inferred a direct relationship by journal time – *Open Access* or conventional – since journals with both types of editorial management are represented in the graph. Therefore, this could be due to a greater affinity with the journals’ scope.

Figure 2. Main journals that publish about the topic: (a) journals with 10 or more papers on the topic (1948–2022); (b) recent evolution of the journals with 15 or more papers on the topic (2015–2021)



(a)



(b)

Source: Authors. Data from Web of Science.

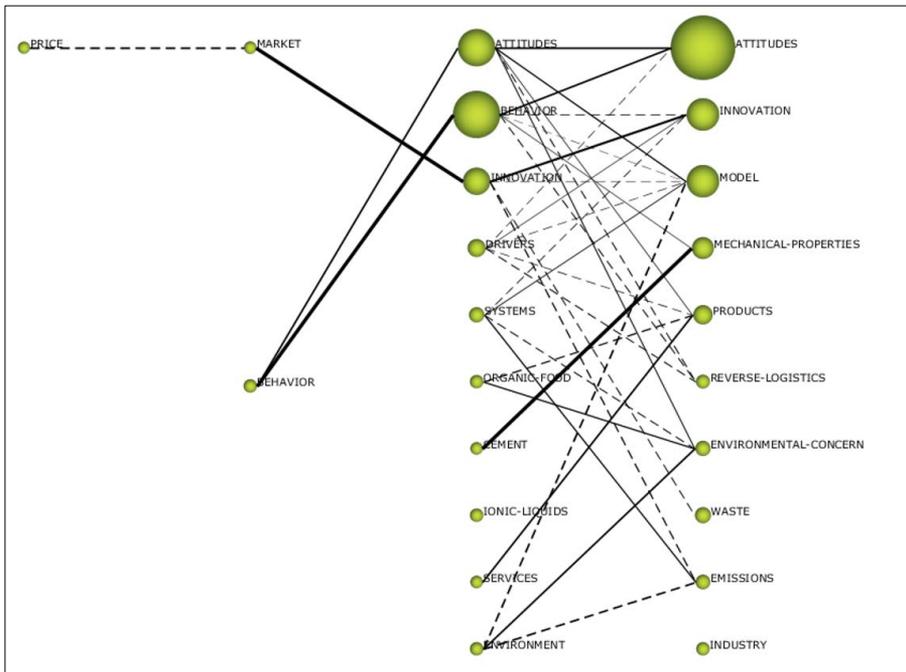
On the other hand, graph (b) of figure 2 shows the evolution of the seven journals with the most articles published in the seven-year interval described. The growth of the journal *Sustainability* is of particular interest because its figures are great, but the *Journal of Cleaner Production* is more constant over time. On the contrary, *Sustainability* experiences impressive growth, going from two papers published in 2017 to 21 in 2018. In 2022, two of the four articles already available in *Early Access* – not represented in figure 2 (b) due to the evident collapse of the lines of the graph – are in the journals *Resources Conservation and Recycling* and *Science of the Total Environment*, which are among the journals in the top of journals with the most publications.

Bibliometric results

Once the distribution of the scientific articles is known, the division of the papers into non-homogeneous time intervals is justified. These intervals are used in the bibliometric analysis undertaken in this section. In this sense, figure 3 shows the *evolution map* of the clusters identified in the six periods previously described. The algorithm for the relationship between periods is the *Inclusion Index*. However, since in the first two periods any cluster was identified, these periods have been omitted from the figure.

Thus, figure 3 represents, from left to right, the following four periods, that is, 2005–2009, 2010–2014, 2015–2019 and 2020–2022. In the third period, the only identified cluster is Price, whose relationship is exclusive with *Market* in the fourth period, having no relation with *Behaviour*. In any case, these two periods are not very illustrative of the state of arts, but they help to visualise the evolution in terms of diversification of the topics addressed as the number of publications on the subject proliferated. In this sense, it is interesting to observe how the *Behaviour* cluster grows between the fourth and fifth periods, as well as that cluster in the fourth period is related to Attitudes in the fifth one. Furthermore, this relationship appeared again between the fifth and sixth periods, with the consequent increase in the volume of the *Attitudes* cluster. However, it is noticeable that, in the sixth period, the *Behaviour* cluster disappears as an independent cluster. The cause of this disappearance is addressed later.

Figure 3. Evolution of the main clusters over the periods



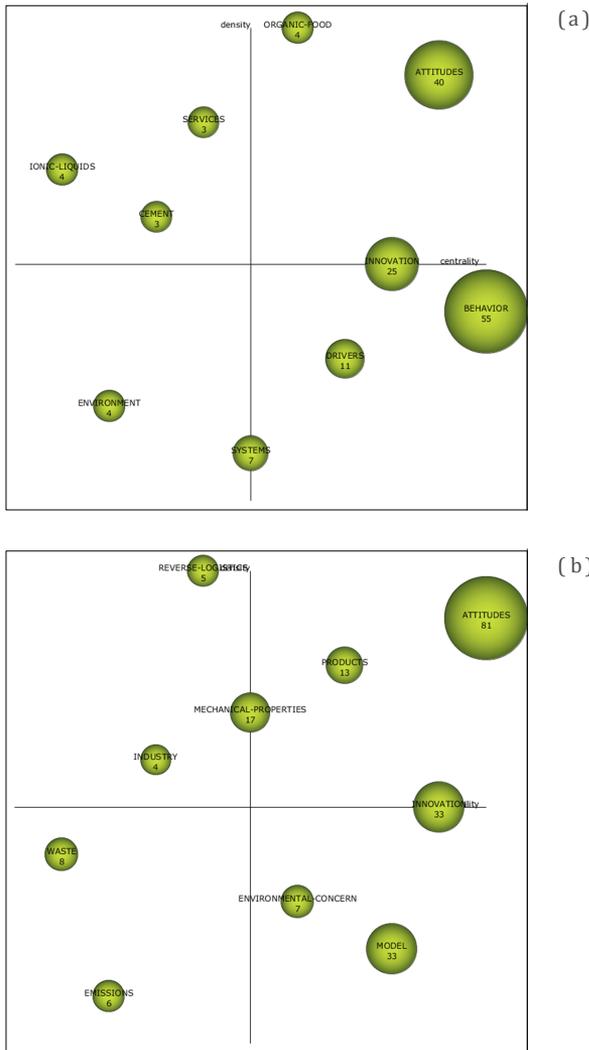
Source: Authors. Data from Web of Science. Software: SciMAT (Cobo et al., 2012).

After showing the evolution over time, a detailed view of the last two periods seems necessary since it contains a significant volume of clusters. Therefore, figure 4 collects both *strategic diagrams*. Following the explanation provided in the *Materials and Methods* section, these diagrams allow knowing the relative relevance of a given topic (He, 1999; Liu et al., 2014). Thus, the issues located in the upper right grid are called motor clusters and represent the knowledge frontier. In both cases, the predominance of *Attitudes* is overwhelming. Likewise, the disappearance of *Organic-Food* and the appearance of *Products* also stand out.

Of course, it must be pointed out that the cluster *Innovation* kept being between the motor cluster quadrant and the core cluster one within two consecutive periods. In this regard, the disappearance of the *Behaviour* cluster at the change of period draws attention once again. For the rest of the clusters in the two remaining quadrants – upper left quadrant, where there are powerful but isolated themes, and lower left quadrant, where emerging or dying themes are

found – the identified themes differ between periods, and the number of documents is relatively small. That could denote a lack of clear lines of research in the development of scientific studies in the field of circular economy from a business perspective.

Figure 4. Strategic diagrams: (a) strategic diagram for Period 5 (2015–2019); (b) strategic diagram for Period 6 (2020–2022)

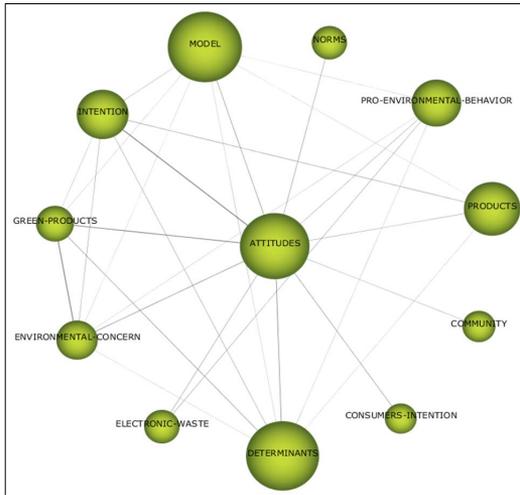


Source: Authors. Data from Web of Science. Software: SciMAT (Cobo et al., 2012).

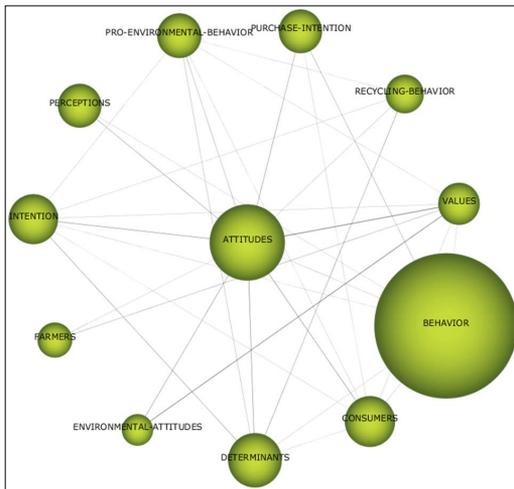
Finally, figure 5 represents the main cluster networks for the fifth and sixth periods. In both cases, this is the *Attitudes* cluster, but it should be noticed how the composition of the network changes substantially. First, and most striking, the *Behaviour* cluster, independent in the fifth period and disappeared in the sixth period, has been absorbed by the *Attitudes* cluster network. That demonstrates the strong relationship between both clusters and their strong interrelation over the years. On the other hand, regarding the composition of cluster networks, the initial conclusion of a lack of temporal consistency in the research on the circular economy is repeated.

However, the fact that the lines of research are not grouped into homogeneous and well-defined topics does not mean that the studies carried out so far are not very relevant or not related. Thanks to the main themes identified in the bibliometric analysis, it is possible to plan better the search for information and to define more accurately the future lines of research. Next, as a complement to the data previously provided, the status of the matter is shown among the documents extracted in the fifth and sixth periods.

Figure 5. Main clusters:
 (a) main cluster in Period 5; (b) main cluster in Period 6



(a)



(b)

Source: Authors. Data from Web of Science. Software: SciMAT (Cobo et al., 2012).

Current State of Arts

Given that the concept of circular economy is well defined, the current literature does not focus on extending, complementing or identifying its elements but on knowing the barriers – and their possible solutions – and drivers, the awareness of the population and companies, their willingness to adopt circular economy models or their purchase intention. Besides, it handles the identification of profiles and characteristics of population groups more likely to adopt these measures or buy products produced under this umbrella.

In the first place, the barriers and drivers that influence the adoption of the circular economy (Camacho-Otero, Boks & Pettersen, 2018) at the business or individual level must be addressed, since they are the factors that define in one way or another the rest of the elements listed above. Starting with barriers, the bulk of them is due to lack of pressure or motivation. Thus, the lack of environmental education, regulatory pressures or market demands (Zhang, Venkatesh, Liu, Wan, Qu & Huisingh, 2019) or acceptance (Nainggolan, Pedersen, Smed, Zemo, Hasler & Termansen, 2019; Coderoni & Perito, 2020) represent passive reasons why companies or individuals are not more involved in adopting green measures. On the other hand, there are also barriers in the strictest sense, in terms of logistics (Abuabara, Paucar-Caceres & Burrowes-Cromwell, 2019), time (Nainggolan et al., 2019), money or costs (Sijtsema, Snoek, van Haaster-de Winter & Dagevos, 2020). In the latter case, companies seem to focus more on implementation costs than future benefits from reducing costs from the waste of raw materials in the production process (Govindan & Hasanagic, 2018; Principato, Ruini, Guidi & Secondi, 2019; Ripanti & Tjahjono, 2019). In addition, there are also barriers arising from the consumers as they might be an influence not to invest in the implementation of circular economy strategies or methods in the enterprise. That is because their purchase intention is diminished if they perceive lower quality or reliability of the products, or they think they are being deceived (Kuah & Wang, 2020).

Closely related to barriers and drivers is the awareness of individuals, consumers and entrepreneurs. It is generally low (Liu, Li, Zuo, Zhang & Wang, 2009; Guo, Geng, Sterr, Zhu & Liu, 2017) or involuntary – caused by the need to save money (Guo et al., 2017) – both at the individual and business level. Although, in the latter case, willingness is low too (Liu & Bai, 2014) and motivated by the market or regulatory pressures. At the individual level, young people are the

most involved (Fogarassy, Nagy-Percsi, Ajibade, Gyuricza & Ymeri, 2018; Smol, Avdiushchenko, Kulczycka & Nowaczek, 2018; Gazzola, Pavione, Pezzetti & Grechi, 2020), although the barrier of risk perception remains (Smol et al., 2018, Singhal, Tripathy & Jena, 2019; Sijtsema et al., 2020).

The latter leads to the drivers (Camacho-Otero et al., 2018) for applying circular economy since the awareness of the environmental cost of wasting resources is a strong motivation (Kuah & Wang, 2020). In this sense, energy and cost savings (Gitelman, Magaril, Kozhevnikov & Rada, 2019) and their inclusion as part of a business model based on the circular economy (Unal, Urbinati & Chiaroni, 2019) are drivers to take into account. Finally, the largest group of drivers corresponds to personal factors of the individuals, that is, age and education as determinants of behaviour (Liu et al., 2009), connection with nature (Solano-Pinto, Garrido, Gertrudix-Barrio & Fernandez-Cezar, 2020) or ecological values as part of a sensitised group (Abuabara et al., 2019).

In this way, the conjunction of drivers, barriers and awareness condition the willingness of companies (Liu & Bai, 2014) and individuals (Lakatos, Cioca, Dan, Ciomos, Crisan & Barsan, 2018; Coderoni & Perito, 2020). In both cases, awareness does not necessarily imply a willingness to adopt green behaviours, both in the case of food [28] and objects, without differences between age cohorts (Lakatos et al., 2018). What is more, all this does not carry a purchase intention. This gap has been little studied, but there are two approaches related to the product, either by the production process or by its functionalities and attributes (Sharma & Foropon, 2019; Sijtsema et al., 2020), and a third one based on the role of agents as enhancers of congruence between awareness and purchase intention, this approach being the most accepted (Lieder, Asif & Rashid, 2017). Likewise, it has been shown that consumers' attitude exerts a moderating effect between willingness and purchase intention (Hazen, Mollenkopf & Wang, 2017; Ndofirepi & Matema, 2019; Ogiemwonyi & Bin Harun, 2020; Kazmi, Shahbaz, Mubarik & Ahmed, 2021), with special mention of green behaviours (Ogiemwonyi & Bin Harun, 2020).

Considering all the above, the question focuses on the solutions proposed in the extant literature. These are diverse and focused on the business world, although some as reducing bureaucracy (Ghenta & Matei, 2018) or green incentives (Lakatos, Dan, Cioca, Bacali & Ciobanu, 2016; Singh, Chakraborty & Roy, 2018) apply to both. Others like product labelling with more information about the green production process (Testa, Iovino & Iraldo, 2020) are exclusive to individuals. At the business level, green project incubators (Millette,

Hull & Williams, 2020) or appropriate green customer segmentation strategies (Gonzalez, Felix, Carrete, Centeno & Castano, 2015; Khare, 2015) are compelling proposals, but the government initiative seems to be the star measure (Govindan & Hasanagic, 2018). The latter is fundamental in the studies for the case of developing countries, either through external aid (Ferronato, Rada, Portillo, Cioca, Ragazzi & Torretta, 2019) or through business benefits or other measures (Lakatos et al., 2016; Lieder et al., 2017). However, it has been shown that green behaviour does not depend on the level of economic development of the country (Ogiemwonyi & Bin Harun, 2020).

Finally, there are other approaches for implementing green measures in the company or taking actions that might improve their environmental position, either through an appropriate roadmap (de Jesús, Antunes, Santos & Mendonca, 2019) or the type of contract with the agents of the supply chain (Li, Wu, Sethi & Zhang, 2021). Likewise, the role of universities (Nunes, Pollard, Burgess, Ellis, de los Rios & Charnley, 2018) and public institutions (da Silva, 2018) in predicting the effects of particular policies on the adequate execution of the green agendas of companies and countries should not be undervalued.

DISCUSSION & CONCLUSIONS

This piece of work reviews the literature about the concept of circular economy and green economy from a behavioural perspective. For this, an in-depth analysis was carried out in several stages. In the first place, the introduction includes the temporal evolution of the concepts associated with these ideas from multiple perspectives. Next, descriptive and bibliometric analyses were performed thanks to the data extracted from the *Web of Science* database. The results of these analyses were especially illuminating. In this sense, the growing interest that the subject has experienced since 2015 stood out, together with the grouping of scientific articles in two journals mainly. In addition, the bibliometric analysis showed the importance of attitudes about environmental behaviour.

That latter point is confirmed with the study of the documents contained in the bibliographic searches that provide data to the analyses carried out in this work. These readings allow observing how the importance of barriers and drivers for the implementation of the circular economy are conditioned in one

way or another by the moderating effect that consumers' attitude has on the willingness to apply circular economy measures and on purchase intention. In addition, other factors that make it possible to identify specific groups of consumers more prone to this type of action are shown, in addition to the most favourable ones for companies.

However, from the bibliometric analysis and specifically from the differences in the clusters identified in the fifth and sixth periods, it might be inferred that the lines of research in the field of circular economy are not homogeneous. On the one hand, that is beneficial since various topics are covered, and academic literature exists in a wide range of branches. On the other hand, that is negative because there are no main concerns in the scientific community beyond identifying drivers and barriers.

That is why, in addition to offering a general picture of the state of arts, supported by statistical techniques – with particular relevance the bibliometric analysis as it is based on clustering techniques – this study can provide potential lines of research based on what is previously known, as it shows what, how and to what degree of depth has been previously studied. Therefore, the main conclusions of this work are that there is no clear study trend and that, consequently, the efforts are dissipating. However, budget limitations are acknowledged when carrying out solid experiments that allow finding general solutions to the problems derived from implementing circular economy strategies or actions. In this regard, the authors of this work find a potential avenue of investigation.

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This research received no external funding.

DATA AVAILABILITY STATEMENT

The data used in this piece of work is publicly available at the *Web of Science* (<https://www.webofscience.com>) through the aforementioned search. It may change due to new papers and/or modifications of the extant ones undertaken by the *Web of Science*.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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