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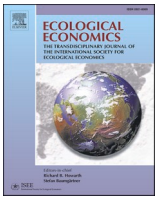

15 years of degrowth research: A systematic review

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ABSTRACT

In academia and political debates, the notions of 'degrowth' has gained traction since the dawn of the 21st century. While some uncertainty around its exact definition remains, research on degrowth revolves around the idea of reducing resource and energy throughput as a unifying theme. We employ a mixed-methods design to systematically review the scientific peer-reviewed English literature from 2008 to 2022 that refers to 'degrowth' or 'post-growth' in title, keywords or abstract ($N = 951$). We find a lack of concrete distributional and monetary policy proposals in the sample analyzed, and a low overall degree of collaboration among authors in relation to degrowth's age and size. The scientific peer-reviewed literature analyzed can be grouped into seven clusters along two major gradients, one along methodology (qualitative-quantitative) and the other along scale-of-analysis (individual-societal). We conclude that the academic literature about degrowth would benefit from a more prominent discussion of the political implications of its ideas and proposals, and that in particular the debate about distributional policy implications of degrowth should be more prominent and concrete, with a stronger focus on distributional policies in a degrowing economy.

1. Introduction

The concept of 'degrowth' emerged at the dawn of the 21st century as a social movement and from there quickly found its way into academic discourse (Demaria et al., 2013). Degrowth has been referred to as a 'political slogan with theoretical implications' (Latouche, 1986; Martínez-Alier et al., 2010). While academic papers do not always explicitly state what they mean when referring to degrowth, a unifying theme among its diverse scholarship is 'a planned reduction of energy and resource use […] in a way that reduces inequality and improves human well-being' (Hickel, 2021, p. 1105) motivated by the biophysical constraints of the economy as sub-system of the Earth. Still, degrowth is an umbrella term rather than a mature concept or theory (Martínez-Alier et al., 2010), and considerably varies in terms of how radical it questions the current status quo (Ott, 2012). In scope, degrowth research can range from descriptive accounts of single communities (e.g., Buhr et al., 2018) to outright anti-capitalist egalitarian theorizing (see, e.g., Schwartzmann, 1996; Zink, 2019). These characteristics arguably make degrowth different from similar concepts like, e.g., steady-state economy, "bioeconomy" or the "green economy" that seem to have less conceptual variability and more disciplinary rooting in academic economic literature.

One of the main issues that degrowth in general is concerned with is inequality and its reduction (Hickel, 2021). Hence, distribution and the question of redistribution of wealth, income and resources have continued to resurface in the degrowth literature (Cosme et al., 2017; Martinez-Alier, 2009; Spangenberg, 2010; Xue et al., 2012). Not so prominently discussed within degrowth, but no less relevant, is the question of money and its role for economic growth itself (see Fig. 1 in Kallis et al., 2018; Strunz et al., 2017). In particular, if money and the monetary system as such indeed fueled the need for economic growth, i.e. if a 'monetary growth imperative' existed, as some economists argue (e.g., Binswanger, 2013), analyses and proposals on how to design a monetary system better in line with the degrowth agenda would be

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much needed. Hence, given the immediate relevance of the monetary growth imperative for degrowth, one would expect that degrowth scholarship would feature the issue of money rather prominently. The same is true for the development of concrete policies addressing distributional issues or monetary system design. However, a lack of concrete policy proposals from the degrowth literature has been lamented repeatedly over the years in different contexts (Berg and Hukkinen, 2011; Bonaiuti, 2018; Demaria et al., 2013; Joutsenvirta, 2016; van den Bergh, 2011), and previous reviews of the degrowth literature have confirmed this on a general level to some extent (Cosme et al., 2017; Fitzpatrick et al., 2022; Sekulova et al., 2013; Videira et al., 2014). In particular, a wide variety of different kinds of goals, objectives and instruments proposed in degrowth has been attested, as well as a 'commonplace' lack of precision in proposals (Fitzpatrick et al., 2022, p. 8). One possible explanation for this lack can be found in the relationship between degrowth and the state. Given the undertheorized role of the state as a central player in the degrowth transition (Demaria et al., 2019; D'Alisa and Kallis, 2020) degrowth faces "a tension between viewing the state as incapable of initiating transformational change and making a political appeal to it to do precisely this via targeted eco-social policies" leaving "a lack in research on the strategic implications arising from conceptualizations of the state and state-civil society relations within degrowth/postgrowth approaches" (Koch, 2020 p. 1).

Here, we review the first 15 years of degrowth research as published in academic peer-reviewed journals. Specifically, we analyze all peer-reviewed research referring to degrowth or post-growth in title, keywords or abstract that was published from 2008 through 2022 as an English language journal article (henceforth: degrowth literature[1]). In particular, using a mixed-methods approach, we address the following four research gaps: (1) we use an inductive multivariate statistical procedure to identify the main clusters within the degrowth literature and to map the conceptual landscape of degrowth; (2) we provide a quantitative account of which journals and authors cater to what cluster; (3) we provide a network analysis of co-authorship in the field; (4) we provide a qualitative analysis of distributional and monetary policy proposals brought forward in the degrowth literature. Our clustering procedure, which is itself inspired by plant ecology's indicator species analysis (Dufrene and Legendre, 1997), is well established and has proven suitable for relatively young scientific fields or concepts that have seen a steep rise in popularity, such as ecosystem services (Abson et al., 2014), sustainability economics (Drupp et al., 2020), transdisciplinary research (Brandt et al., 2013) or resilience (Nüchter et al., 2021). The advantage of using our multivariate statistical clustering procedure over other forms of clustering is that it classifies papers into clusters based on similarities in conceptual vocabulary, thereby minimizing subjectivity in the sense of potential biases and preconceptions. The latter point seems especially called for given the delicate stance that degrowth takes, or seems to take, towards some of the main tenets of 'orthodox' (or 'mainstream') economic theory (cf. Hickel, 2021). In addition, we use a network analysis approach of bibliometric data through co-authorships to identify influential authors and clusters of close collaboration. This mixed-methods approach with a firm base in multivariate statistics also provides an alternative to other recent reviews of the field that have focused exclusively on qualitative clustering methods (Fitzpatrick et al., 2022; Kallis et al., 2018; Weiss and Cattaneo, 2017).

Our paper proceeds as follows. After clarifying the key concepts such as décroissance, stationary economy and degrowth in Section 2, we give a detailed overview on our methods used in Section 3. Section 4 presents our results, before we discuss them in Section 5 and draw some conclusions in Section 6.

2. Conceptual clarifications

We clarify the most important concepts relevant in the degrowth discourse in the following. In particular, we follow Martínez-Alier et al. (Martínez-Alier et al., 2010) in distinguishing between the French approach to degrowth, i.e. décroissance or 'de-growth à la Française', and degrowth in ecological economics.

2.1. Sustainability and economic growth

Initiated by the groundbreaking ideas of Boulding (1966), Daly (1968), Georgescu-Roegen (1971) and the publication of *The Limits to Growth* (Meadows et al., 1972), today's scientific, societal and political discourse around how a sustainable economy can be achieved is dominated by two major strands. One can be subsumed by the umbrella term of *degrowth*, and the other one centers around the idea of *green growth* (Jackson, 2009). The major fault line between these strands is their stance towards necessity and desirability of some form of economic growth. Proponents of green growth generally argue that economic activity can grow in spite of physical planetary boundaries. The main argument of this approach is the theoretical possibility of an absolute decoupling of economic growth and environmental impacts if certain assumptions are met (Jackson, 2009; Kallis et al., 2018). Here, absolute decoupling means economic growth in conjunction with decreasing resource consumption in absolute terms (e.g., Jackson, 2009).

On the other hand, not only do proponents of degrowth criticize green growth's focus on growth, they generally argue that an economic system that is mainly focused on growth is the main reason for the increasing exceedance of planetary boundaries (Hickel and Kallis, 2020). Therefore, the degrowth literature organizes around two direct criticisms of central tenets of green growth. First, based on Jevons's paradox, degrowth scholars doubt that increased efficiency could

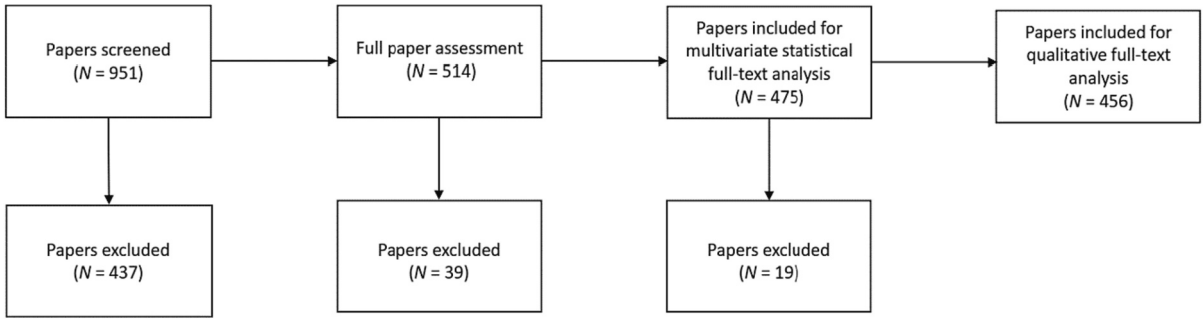

Fig. 1. Overview of the paper screening and review process.

[1] We are aware that some degrowth research is also published in other ways, in particular books. Yet, it also holds that peer-reviewed journal articles are the most important (and prestigious) outlet in many research fields, including economics.

increase a decoupling of resource use and production output (e.g., Dorninger et al., 2021). Secondly, based on Georgescu-Roegen (1975), they maintain that the much needed switch from fossil fuels to renewables would come with a decrease in energy available, which would entail a decrease in economic production.

2.2. Décroissance

The idea of *décroissance* emerged in France in the mid-1970s as a direct reaction to *The Limits to Growth* (1972). According to Muraca (2013), décroissance was first used as a term by Amar (1973) in a rather loose way to critically reflect upon the western model of economic development, before French translations of some of the works of Georgescu-Roegen (Georgescu-Roegen, 1979) popularized décroissance as an alternative to the already established idea of *zégisme* (i.e. zero growth). In particular, Georgescu-Roegen (1975) application of thermodynamics to economic processes has been central to décroissance and its English speaking sibling of degrowth. A central characteristic of décroissance is its critical stance towards the western model of human development (Martínez-Alier et al., 2010). Concretely, it questions its tacit assumption that economic development and human progress are correlated (e.g., Illich, 1973, 1974; Latouche, 1986) and proposes voluntary simplicity as a means to free the individual from modern consumerism, with places like Can Decreix at the French-Spanish border as exemplified alternative modes of living (see http://www.candecreix.cat/). Historically, the French-speaking discourse about décroissance is older than the one about degrowth, but the French word décroissance is often translated as "degrowth" in English texts (Martínez-Alier et al., 2010), making it a de-facto synonym without actually meaning the exact same thing.

According to Martínez-Alier et al. (2010), décroissance has a clear eco-socialist agenda, i.e. décroissance sees economic questions as necessarily political questions, which ultimately lead to the abolishment of capitalism. Furthermore, décroissance is "anti-economics" in a sense that economics is seen as a discipline that should be abandoned (ibid.). Arguably, this position is at odds with degrowth in the wider ecological-economic sense, in particular with Herman Daly's steady-state economy.

2.3. Degrowth

Degrowth, in the sense of the word that we aim at here, was established as a scientific concept at the first international degrowth conference in Paris in 2008, which has been seen as a cornerstone for an international research agenda (Demaria et al., 2013). While some common ground between décroissance and degrowth can be identified, for example in their appreciation of Georgescu-Roegen's works, there are notable differences. Particularly, there is a close connection of degrowth to ecological economics through influential texts such as Meadows et al. (1972), Schumacher (1973), Boulding (1981) and Daly (1981), who all have a decidedly biophysical understanding of the economy entailing a need for a reduction of economic activity. Notably, the size and extent of this reduction remains an area of considerable debate. In contrast to décroissance, degrowth scholars do not generally proclaim the necessity of a sustained reduction of economic activity, but see the concept of stationary economy as an aim. In the modern sense, an economy is stationary if it does not grow for an extended period of time.

The current understanding of the stationary state is based on the works of Herman Daly (Daly, 1981, 1996). Daly coined the term of a steady-state economy, which he refers to as a state of stationarity of capital and labor in the long run. The key point in Daly's conception is the embeddedness of the economy into a materially non-growing, finite ecosystem which provides natural resources and energy as production inputs as well as serves as a waste repository. As a consequence, economic throughput, i.e. material and energy, should be at a low level in the long run while population and produced 'artefacts' should be kept constant. Thus, Daly's steady-state economy is an example of a stationary economy.

The concept of a stationary economy can be seen as a complement to degrowth rather than a synonym (Martínez-Alier et al., 2010). Some have argued that the aim of degrowth is a socially and ecologically just transformation of economic activity, which itself remains within socially and ecologically viable boundaries (Schneider et al., 2010). In this understanding, degrowth describes a way towards a steady-state economy, which requires a transformation of social and financial institutions. Furthermore, many degrowth scholars support the view that a sustained negative growth (degrowth) of the economy cannot be an end in itself, but much rather a means to the end of a stationary economy (Hickel, 2021; Kerschner, 2010; Martínez-Alier et al., 2010; O'Neill, 2012; Schneider et al., 2010). As Hickel puts it, 'proponents of degrowth are therefore condemned to perpetually clarify that degrowth is not about reducing GDP, but rather about reducing material and energy throughput' (Hickel, 2021).

In comparison to décroissance, the degrowth discourse is less radical and rooted in ecological economics. Ecological economics criticizes the economic mainstream, for example the use of GDP as a policy indicator, but it seeks to vindicate economics as a discipline rather than abandoning it, in particular by adding to the body of ecological-economic theory from which concrete policy proposals can be developed. Thus, degrowth aims at reforms of existing institutions and systems rather than revolutions (Kallis, 2011).

3. Methods

Generally, we follow the research design and methodology established in our earlier systematic reviews that aimed at particular concepts (Abson et al., 2014; Brandt et al., 2013; Nüchter et al., 2021) or research fields (Drupp et al., 2020). We outline this process in the following, a graphical overview can be found in Fig. 1.

3.1. Search strategy and procedure

We queried the Scopus database in February 2023. Scopus is preferable to Google Scholar, especially when analyzing emerging research fields such as in the present study (e.g., Abson et al., 2014; Beckmann and von Wehrden, 2012; Rathgens et al., 2020). We used the following criteria: (1) occurrence of the terms "degrowth", "de-growth", "post-growth" or "post-growth" in article title, abstract or keywords; (2) publication in English language; (3) publication as a journal article; (4) publication date between January 2008 and December 2022.[2]

Our search strategy implies the restriction to the academic discourse on degrowth (and post-growth) as published in peer-reviewed journal articles. The reason for this restriction is our motivation to analyze and map the academic research landscape on degrowth as an emerging academic field. Given the publication culture in economics, industrial ecology and ecology, we advocate that the best way to tell what is going on in degrowth research as an academic field, as opposed to the larger social movement of degrowth, is to read peer-reviewed scientific journal articles on degrowth. This restriction led to the exclusion of conference

[2] Therefore, our search string was as follows: TITLE-ABS-KEY (degrowth OR de-growth OR post-growth OR postgrowth) AND (LIMIT-TO (PUBSTAGE, "final")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (SUBJAREA, "SOCI") OR LIMIT-TO (SUBJAREA, "ENVI") OR LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "ECON")) AND (LIMIT-TO (PUBYEAR, 2022) OR LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR, 2019) OR LIMIT-TO (PUBYEAR, 2018) OR LIMIT-TO (PUBYEAR, 2017) OR LIMIT-TO (PUBYEAR, 2016) OR LIMIT-TO (PUBYEAR, 2015) OR LIMIT-TO (PUBYEAR, 2014) OR LIMIT-TO (PUBYEAR, 2013) OR LIMIT-TO (PUBYEAR, 2012) OR LIMIT-TO (PUBYEAR, 2011) OR LIMIT-TO (PUBYEAR, 2010) OR LIMIT-TO (PUBYEAR, 2009) OR LIMIT-TO (PUBYEAR, 2008) OR LIMIT-TO (PUBYEAR, ar) OR LIMIT-TO (PUBYEAR, english)).

papers, books and book reviews, notes and comments, editorials, errata and corrigenda, letters and short surveys and publications listed as 'undefined' in the Scopus database. Our findings therefore complement the recent qualitative review by Fitzpatrick et al. (Fitzpatrick et al., 2022).

Moreover, we added the following additional restrictions to our search process: (1) we restricted our search results to the subject areas social sciences, environmental sciences, business and economics to minimize the number of false positives. For example, in medicine, life science and biology, the term degrowth is often associated with bacteria or tissue; (2) we limited our search to the years from 2008 onwards, because this was the year of the first international scientific conference on degrowth (cf. Section 2.3). The sole publication in 2007 in our database was about the launch of a political party named "Degrowth Party" in France (Baykan, 2007). Our search led to an initial database of 951 scientific articles in English-language journals with peer review.

3.2. Paper screening

Two of the authors (MFK and JOE) screened the abstract of every publication in the initial database and excluded all publications that met at least one of the following criteria: (1) use of degrowth or postgrowth as a buzzword; (2) degrowth was only a minor focus in the publication (such as in the above example about a French political party). The screening process resulted in the exclusion of 437 articles. We then read the full text of all remaining articles and checked whether any further remaining publications met at least one of the two exclusion criteria. This step led to further exclusions of 39 articles, which left $N = 475$ articles for the full-text multivariate statistical analysis.

3.3. Mixed-method content analysis

Our analysis follows a mixed-methods approach, i.e. it contains a qualitative and a quantitative part. Quantitatively, we used the full-text multivariate statistical analysis developed by von Wehrden and colleagues (Abson et al., 2014) on the final data base of $N = 475$ articles. Detailed and up-to-date descriptions of the statistical procedure have been documented elsewhere (Drupp et al., 2020; Nüchter et al., 2021; Rathgens et al., 2020). All statistical analyses were conducted in the R programming language, versions 3.6.3 and 4.2.2 (R Core Development Team, 2022).

For the qualitative analysis, we excluded the papers in our sample from the décroissance literature ($N = 19$), because these did not make concrete distributional or monetary policy proposals. Here, we understand a policy proposal as a concrete measure to address a political issue including a detailed argument for that measure, no matter if empirical or conceptual. Moreover, they generally argued for fundamental social and economic reforms or even seem to have been written with the tacit assumption of such reforms as a prerequisite in mind.

We distinguished between three categories of articles: empirical, conceptual, and review (Rathgens et al., 2020). In the next step, we checked whether articles made an original policy proposal or if they referenced or discussed other proposals from the literature, a simplified version of the procedure put forward by Brandt et al. (2013). For the sake of this study, we defined a policy proposal as a detailed empirical or conceptual argument for a concrete policy measure put forward to address an economic issue as defined by the respective authors. If policy proposals were found, we extracted or paraphrased them from the text, and checked whether they were concerned with monetary or distributional policies aimed at contributing to the concrete realization of the degrowth agenda.

3.4. Network analysis

For the network analysis of co-authorship, we used the Scopus meta data to extract the co-authorships on each paper. In the metadata, each observation represents an article within the scope of this review. All author names are extracted using regular expressions, and added to a list of unique author names. If an author name appeared together with another author name in the same article they are depicted as co-authors. Each author is then represented as a node and each co-authorship is represented through a connecting edge. We calculated the network density as the ratio of the number of actual connections to the number of potential connections (in %).

The procedure provides insights into the overall connectedness of the network and is able to identify clusters of collaboration, as well as two types of potentially influential authors: (1) brokers, who are involved in many collaborations and (2) solitary authors with a large number of publications, but little or no collaborations. The following metrics were extracted to characterize the network:

- Network density: We quantified the proportion of connections that exist in a network relative to the total number of possible connections to give insights into the extent of collaboration within the scientific community investigated here.
- Publications: We summarized the appearances of each unique author name in the dataset to gain insights on how many articles each author contributed.
- Degree: Consists of the number of edges that are connected to a node. We use this indicator to highlight authors that have a large number of collaborations.
- Betweenness: This metric quantifies the centrality of a node, which quantifies how often each node acts as a bridge along the shortest paths between other nodes in the network. In the context of a co-authorship network, authors with high betweenness centrality are those who connect different groups of researchers, acting as crucial intermediaries in the flow of information and collaboration.

4. Results

4.1. Multivariate full-text statistical analysis

From the $N = 475$ papers included in the multivariate full-text statistical analysis, we extracted a list of abundant words, which appeared in more than 5% of publications. From this, we extracted a list of abundant conceptual vocabulary, i.e. we deleted all words that carried no conceptual meaning, and analyzed co-abundancies of words between papers (Abson et al., 2014; Nüchter et al., 2021; Rathgens et al., 2020). The rationale behind this procedure is the assumption that papers using a similar conceptual vocabulary are likely conceptually similar. This type of analysis is typically used in ecology to identify habitats based on the species found in them (see Dufrene and Legendre, 1997). In this sense, our analysis identifies 'paper habitats' (i.e. research clusters) based on similarities in conceptual vocabulary used.

Fig. 2 highlights these research clusters. The axes of the plot can be identified with gradients that represent methodological diversity ranging from qualitative to quantitative on the x-axis, and differing base units of analysis ranging from the individual to the societal level on the y-axis. The plot of the de-trended correspondence analysis (DCA) shows the most significant indicator words of each cluster. The clusters can be summarized as follows.

- Conceptual foundations (Cluster 1, 54 papers): The papers in this cluster focus on conceptual issues as well as the economic and natural-science foundations of degrowth. Publications typically try to answer the question of what degrowth actually means or should mean and discuss practical consequences that arise from their definition. That is, papers tend to take a diverse perspective on the meaning of degrowth, both theoretically and practically, e.g. by focusing on education or socio-economic aspects, often including or drawing on discussions of degrowth's history of thought. A defining feature of this cluster of degrowth research is a larger share of

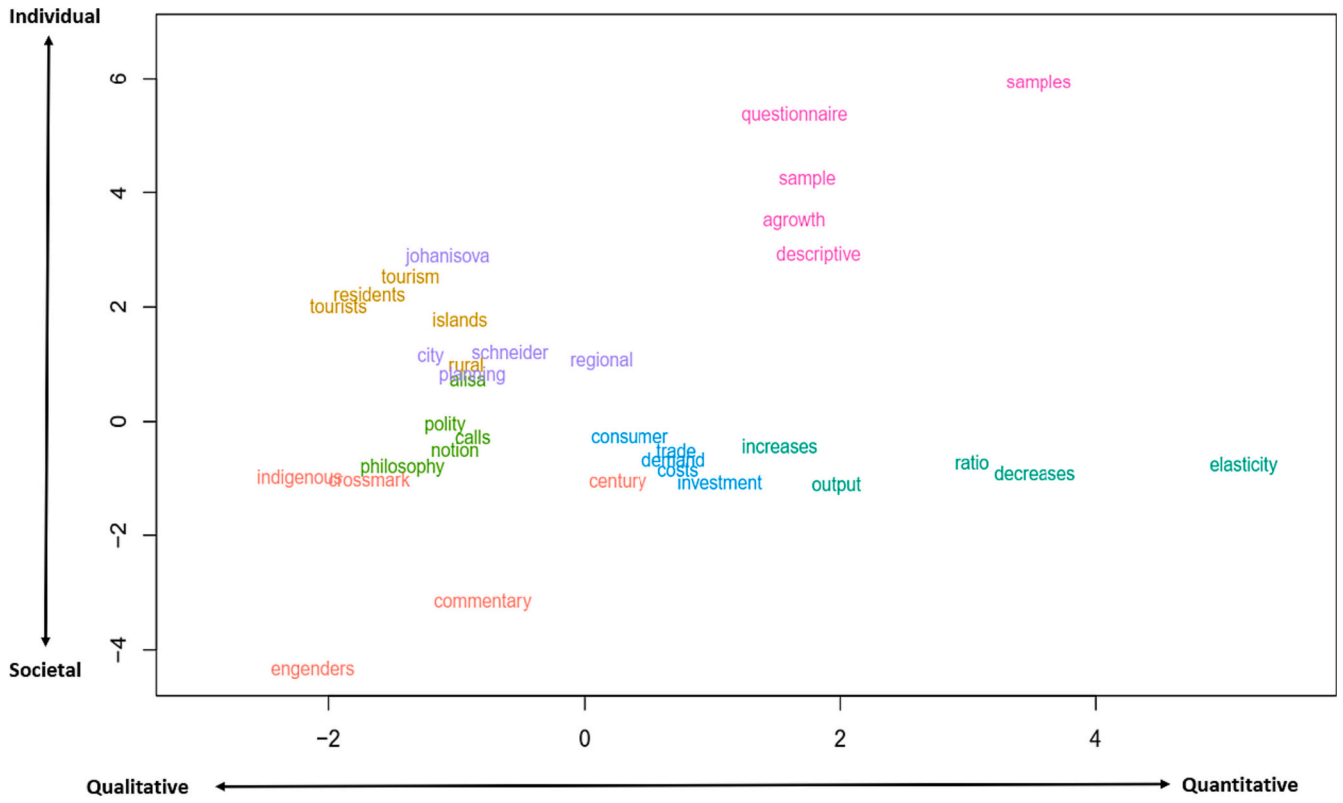

Fig. 2. De-trended correspondence analysis of the most significant indicator words for each cluster. Ordination and clustering are based on the full-text analysis of $N = 475$ relevant research papers in the sample.

contributions in the form of comments and replies, which indicates a high level of discursiveness, along with a focus on qualitative aspects and society in general as indicated by the cluster's bottom left location on the DCA plot (Fig. 2).

- Degrowth, culture and power (Cluster 2, 51 papers): Papers in this cluster deal with societal movements similar to degrowth in different cultures and their relation to the degrowth movement, often with a focus on power relations between and within cultures. A frequent motif in this cluster is the discussion of regional case studies in rural areas with a focus on economic sectors such as tourism or agriculture (e.g., blue (de-)growth or degrowing/slow-growing tourism). The regional focus is reflected by the cluster's middle position on the y axis in the DCA plot (Fig. 2). With its focus on power relations as a driver of growth and economic development, the cluster has conceptual ties with the literature on environmental justice.
- Flavors of degrowth (Cluster 3, 111 papers): Papers in this cluster focus on possible variants of degrowth, in particular on aspects of what makes a good life within planetary boundaries. This includes the philosophy of science behind degrowth, discussions of various philosophical and ethical aspects of degrowth variants and utopias and their relationship to each other. Consequently, the cluster contained a broad range of discussions related to aspects of what constitutes and contributes to a good life, such as unconditional basic income, voluntary work, care work, job guarantees, or good and meaningful work for everyone, including the discussion of alternative forms of society and economy (e.g., eco-socialism, steady-state economy). Hence, 'good life' is generally about qualitative improvements in specific situations rather than quantitative increases in abstract indicators. Methodologically, papers in this cluster are largely conceptual with only a minority using empirical data and data analysis to back up their arguments empirically.
- Quantitative modeling (Cluster 4, 107 papers): Papers in this research cluster have a clear focus on quantitative analysis of empirical data or theoretical models. Under this umbrella however, there is a large variety in terms of conceptual approaches ranging from analysis of macroeconomic theories of degrowth in a physically limited world to empirical studies of material throughput or determinants of post-growth acceptance among Europeans. Papers tend to take an analytical perspective on degrowth in the sense of developing and analyzing "what-if?" scenarios, often further developing and refining existing economic theory according to degrowth-specific aspects. Thus, papers in this cluster of degrowth research typically take a relatively neutral stance towards desirability of degrowth a priori, and often a bird's eye perspective on the economy as a whole.
- The limits to growth (Cluster 5, 70 papers): Papers in this cluster generally argue for the need for a drastic, immediate and radical change of economic system, typically from a resource limitation perspective. That is, papers focus on natural resource scarcity in light of (future) demand given the current growth paradigm, and often refer to the collapse of the current economic system or some of its parts. Research in this cluster tends to describe the state of things in general, including scenarios for the relatively near future (e.g., the year 2050), and has a strong appellative element in posing the system question explicitly as indicated by terms such as "ecological capitalism" (Turnbull, 2015), the "Simpler Way" (Trainer, 2020), or references to Marxism. Papers tend to either explicitly criticize capitalism and the status quo or to outright reject it. This research cluster also features critiques or critical analyses of concepts that have been brought forward as alternatives or fixes to the current system such as circular economy, bioeconomy and green economy.
- Transition management (Cluster 6, 70 papers): Papers in this cluster deal with the question of how degrowth could be achieved and governed in concrete settings, and how such transitions could be measured or monitored in practice. Thus, there is a strong connection to the transition management literature, which manifests itself in

frequent reference to concepts such as "just transitions", "multi-level perspective on system change" or "transformative geographies". Albeit occasionally discussing specific cases, papers in this cluster often have an emphasis on theory development and discussion. Research in this cluster takes a middle ground in terms of its unit of analysis, often looking at cities, regions or single economic sectors (e.g., energy, agri-food). Papers tend to use qualitative or mixed-methods and often feature a pragmatist view on how a degrowth transition could be managed given current circumstances.

- Degrowth perception and communication (Cluster 7, 20 papers): Papers in this research cluster tend to focus on the perception of degrowth terminology in the general public, in particular of the term degrowth itself, often with the aim of identifying persuasive frames for a degrowth or post-growth society. Methodologically, this cluster tends to focus on empirical surveys and the analysis of single cases such as the general public in a country or, e.g., certain Amazonian small-scale societies. Research in this cluster is relatively recent as 18 papers (i.e. 90%) have a publication year of 2016 or more recent.

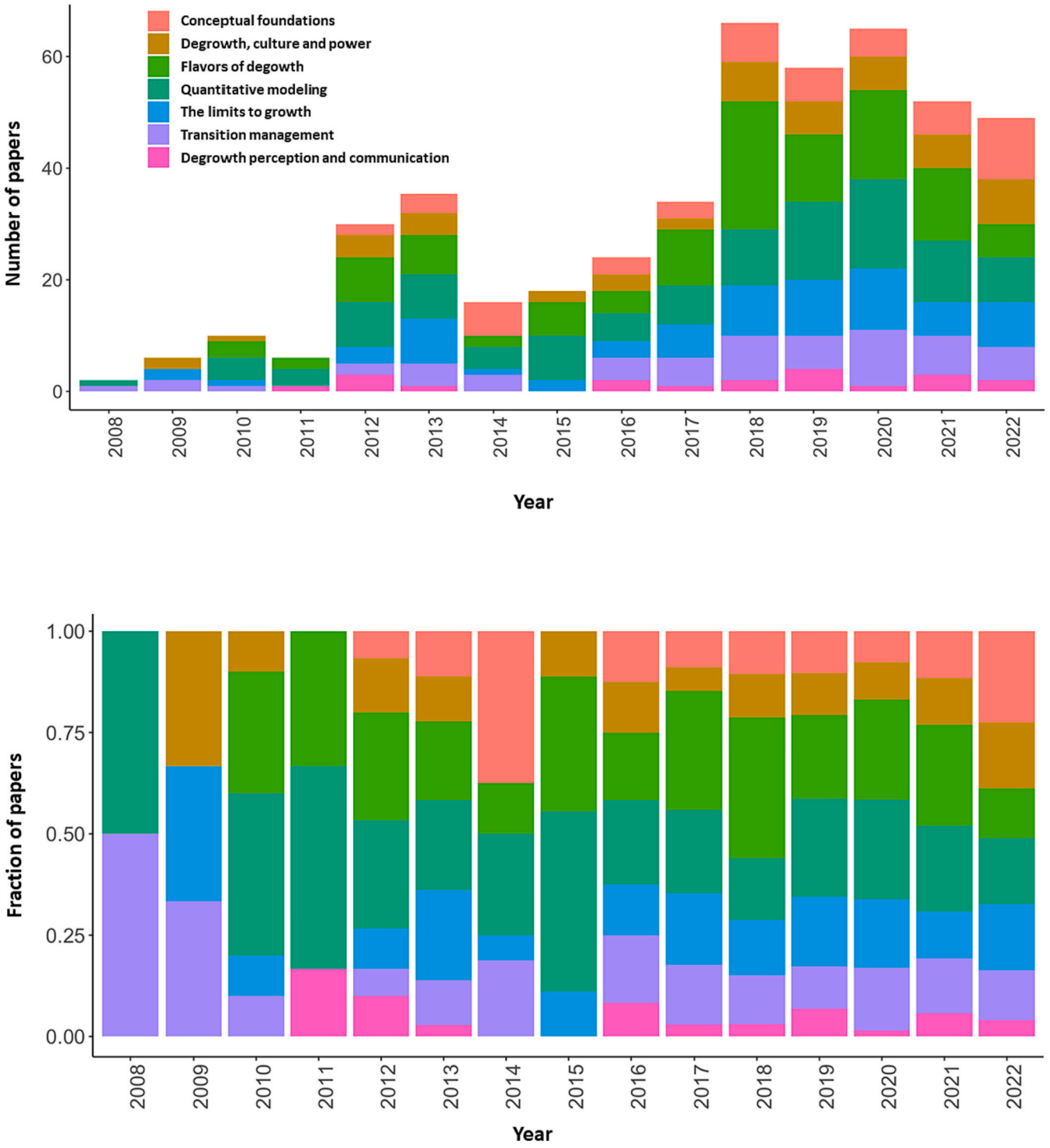

Fig. 3. Absolute number of papers per cluster (upper panel) and their relative share per year (lower panel).

We found an increase over time in the total number of papers published, albeit not a steady one (Fig. 3). There was a strong rise in the number of publications in the first five years until 2013 from near zero to just under 40 publications per year. After a dip to about half that level in 2014, there was a second wave of degrowth publications topping out at just above 60 publications in 2018. The number of annual publications has since never gotten back to this level, but appears to stabilize at a publication rate of more or less 50 per year. In terms of cluster contributions, all seven clusters have been continuously represented since 2016, and the least diverse years in this regard have been the first two, i.e. 2008 and 2009. In spite of being the smallest cluster by far with just 20 papers, cluster 7 (degrowth perception and communication) has appeared in all but five years (2008–10, 2014–15) of the period under study. The cluster with most appearances in this sense was cluster 4 (quantitative modeling) with the only missing year being 2009. The relative importance of clusters as measured by their percentage share of contributions to the peer-reviewed degrowth literature has remained relatively stable since 2016 as no major shifts are observable. If anything, there is some evidence for a light shift towards publications from clusters 1 (conceptual foundations), 2 (degrowth, culture and power) and 3 (flavors of degrowth), and possibly a slight shift away from quantitative modeling (cluster 4) in the three most recent years.

4.2. Journal and author analysis

In terms of publication outlets, we found that research on degrowth in our database was distributed over 174 peer-reviewed scientific journals. 49 journals had more than one publication in our database, the 20 most publishing of which we display in Table 1. 289 out of 456 papers (63.4%) in our database were published in one of these 20 journals. By a large margin, the journals *Ecological Economics* (67 entries) and *Journal of Cleaner Production* (57) were the most common publication outlets accounting for 27.2% (i.e. 124 out of 456) of all publications in the sample, followed by *Sustainability* (26) *Futures* (21), *Capitalism Nature Socialism* and *Journal of Political Ecology* (19 each). Therefore, these six journals alone accounted for 209 or 45.8% of all peer-reviewed publications on degrowth or post-growth in the period under study. 125 different journals had just one publication on degrowth in the period from 2008 through 2022.

Five journals covered all seven research clusters (*Ecological Economics, Journal of Cleaner Production, Sustainability (Switzerland), Capitalism, Nature, Socialism and Sustainability Science*), and two journals had publications in six out of seven research clusters (*Environmental Values*, *Journal of Political Ecology*). Out of the 289 papers published in the 20 most publishing journals, 183 (63.3%) were part of a ranking of academic economics journals, either the one proposed by Mixon and

Table 1
The 20 most publishing journals in our database along with the most common quality indicators.

Journal	Quantity	Conceptual foundations	Degrowth, culture and power	Flavors of degrowth	Quantitative modeling	The limits to growth	Transition management	Degrowth perception and communication	SJR index (2022)	Impact factor (2022)
Ecological Economics	67	6	2	14	24	7	6	8	1.43	7.0
Journal of Cleaner Production	57	3	4	20	15	9	4	2	1.98	11.1
Sustainability (Switzerland)	26	1	5	6	7	3	3	1	0.66	3.9
Futures	21	5	4	10	0	2	0	0	0.89	3.0
Capitalism, Nature, Socialism	19	5	1	4	5	2	1	1	0.86	0.7
Journal of Political Ecology	19	1	1	3	3	7	4	0	0.75	0.8
Sustainability Science	15	2	1	3	3	2	3	1	1.54	6.0
Environmental Values	12	2	1	2	1	4	2	0	0.73	2.2
Local Environment	8	0	2	0	2	1	3	0	0.75	2.4
Journal of Sustainable Tourism	7	0	2	0	3	0	2	0	2.97	9.0
Globalizations	6	0	0	0	2	3	1	0	1.00	2.5
Environment and Planning E: Nature and Space	5	0	2	3	0	0	0	0	1.09	2.9
Sustainability: Science, Practice, and Policy	5	3	0	1	1	0	0	0	1.86	1.8
Management Revue	4	1	0	1	0	0	2	0	0.18	0.4
Annals of the Fondazione Luigi Einaudi	3	1	0	0	1	1	0	0	0.19	0.1
Environment, Development and Sustainability	3	0	0	1	1	0	1	0	0.84	4.9
Environmental Politics	3	0	0	2	0	1	0	0	1.85	5.5
Global Environmental Change	3	1	0	1	0	1	0	0	2.95	8.9
Int. Journal of Sociology and Social Policy	3	1	0	0	1	0	0	1	0.60	0.5
Organization	3	0	0	1	0	0	2	0	1.96	3.0
Sum	**289**	**32**	**25**	**72**	**69**	**43**	**34**	**14**		

Upadhyaya (2020) or the two rankings popular among German-speaking economists (VHB-JOURQUAL 3, *Handelsblatt* [2017]). Clusters 3 (flavors of degrowth) and 4 (quantitative modeling) had the largest share of papers that were published in journals ranked in this sense (18.0% and 16.2%, respectively), and all other clusters remained well below 10%.

Fig. 4 presents the overall structure of the collaborations among degrowth scholars. The network consists of a very low network density (0.32%) and many solitary authors. The network of authors that are part of this review consists of 632 authors. Of these 632 authors 441 have less than three authors they collaborate with. 17 authors have ten or more collaboration partners. Most of the collaborations consist of less than two publications. However, one cluster of authors is visible that shows a higher collaboration density (upper part of Fig. 4).

Fig. 5 shows the cluster of higher collaboration density in more detail. The density of this sub-network is 5.79%, a value 18 times larger than that of the overall network. In this visualization, authors with a higher centrality score appear more closely to the middle. Number of publications are indicated by the size of the labels. Authors with the most publications, degrees and betweenness scores are almost completely located in this cluster (cf. Table 2).

4.3. Policy proposals

The majority of papers included in the qualitative full-text analysis did neither contain nor discuss any policy proposals ($N = 307$, or 67.3% out of 456). 149 papers (32.7%) discussed policy proposals, either by cross-referencing the proposals of others ($N = 71$, or 15.6%) or by developing new proposals ($N = 78$, or 17.1%). Of those that developed new policy proposals, the vast majority was conceptual ($N = 51$, or 11.2%), only 22 papers (4.8%) had an empirical research design, and the remainder ($N = 5$, or 1.1%) were literature analyses that reviewed and discussed different proposals from the research landscape (Fig. 6). We further elaborate on this literature in the following sections.

4.3.1. Monetary policy proposals

Monetary policy proposals were discussed in 16 publications. 12 of these publications were conceptual, four empirical, and 10 discussed or cross-referenced proposals made by others. Some of the literature in this strand ($N = 4$) emphasized a necessity for change of the current monetary system, albeit without further specification of the concrete problems or options to act (Demaria et al., 2013; Schneider et al., 2010; Speth, 2012; Videira et al., 2014). An additional four publications called for changes in the monetary system based on arguments of a monetary growth imperative within the current monetary system (Gerber, 2015; Johanisova et al., 2013; Spangenberg, 2013; van Griethuysen, 2012). One publication discussed the structural constraints of a monetary system in a stationary economy using a Kaldor-Kalecki model (Cahen-Fourot and Lavoie, 2016). $N = 6$ articles discussed the potential of alternative and complementary currencies (Balaguer Rasillo, 2021; Fitzpatrick et al., 2022; Gómez and Prado, 2020; Greenham and Ryan-Collins, 2013; Hornborg, 2017; Marshall and O'Neill, 2018).

4.3.2. Distributional policy proposals

Distributional policy proposals were discussed in $N = 33$ publications. 25 of these publications were of conceptual nature, eight empirical and 19 publications discussed or cross-referenced proposals made by others. The policy proposals included the introduction of a minimum guaranteed income, either in the form of a negative income tax (Alexander, 2012), by lump-sum transfer payments combined with direct provisioning of utilities or mobility to recipients by the state (Dukelow and Murphy, 2022; Heikkinen, 2020; Malmaeus et al., 2020; Spangenberg, 2014), or by introduction of a job guarantee based on human rights (Alcott, 2013). Concerning the question of how to finance these measures, the proposals discussed or mentioned were a strongly progressive income tax with a maximum marginal tax rate of 100% (Alexander, 2012; Spangenberg, 2014), a maximum income (Paulson et al., 2020), a wealth tax (D'Alessandro et al., 2020; Murphy, 2013), financial transaction taxes (Murphy, 2013; Spangenberg, 2014), the establishment of international tax agreements (Fyock, 2022) or a planned reduction of monthly working hours per worker (Alcott, 2013).

5. Discussion

5.1. Insights from the multivariate full-text statistical analysis

The multivariate full-text statistical analysis of the degrowth research literature published in the period 2008–2022 reveals a somewhat fragmented research landscape. We identified seven distinct research clusters with a strongly shared conceptual vocabulary each. The ordination plot of the de-trended correspondence analysis (DCA, Fig. 2) locates these clusters within a research spectrum that shows a relatively large dispersion on the x-axis (from −2 to almost +6) and on the y-axis (from −4 to +6). Generally, a difference of four DCA units

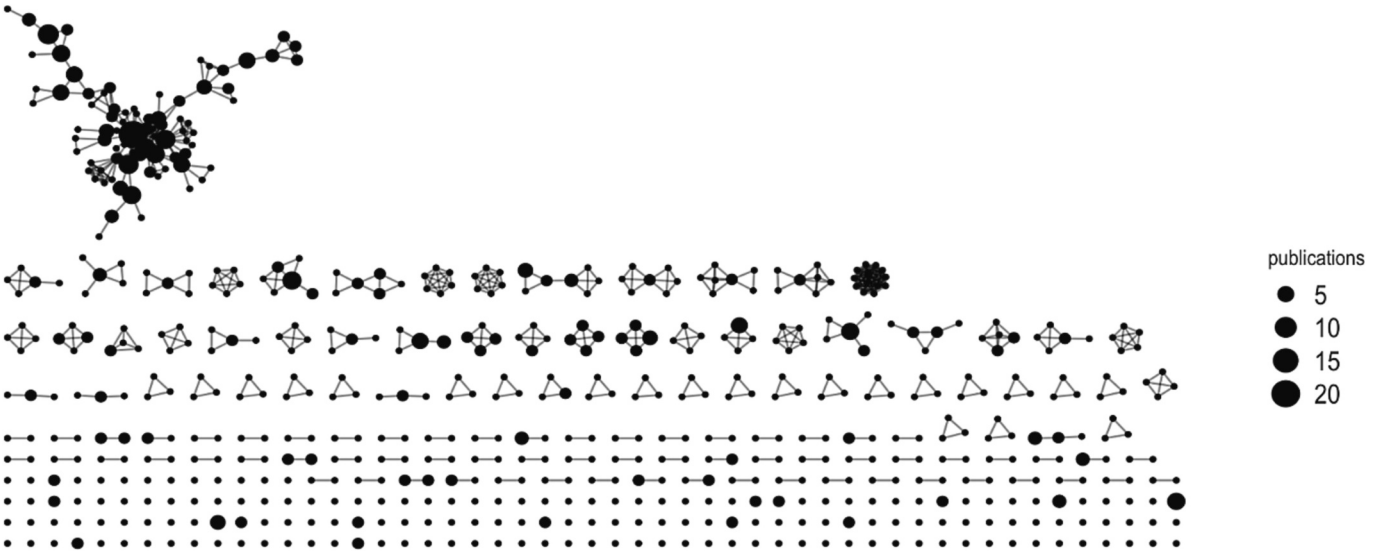

Fig. 4. Overall structure of the collaborations in the research field of degrowth. The majority of authors works solitarily or with minimal collaboration (lower part of figure), but there is one clear network of closer collaboration (upper part).

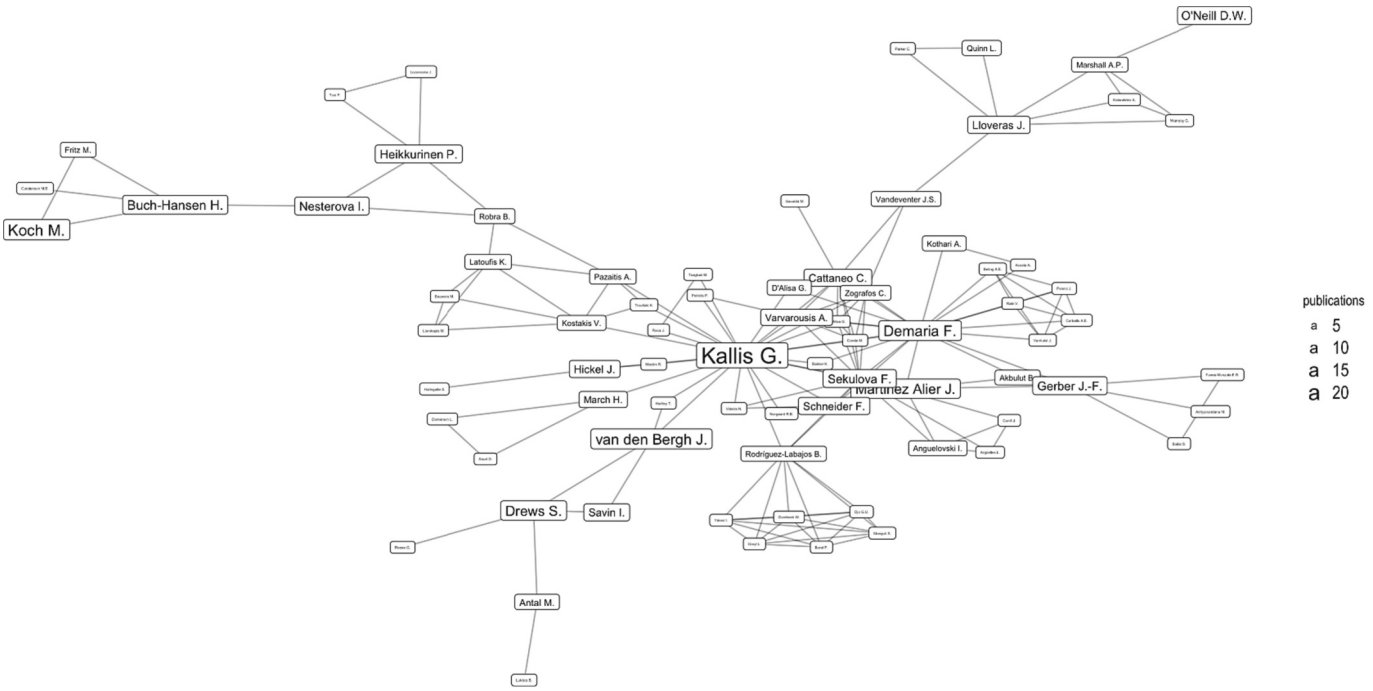

Fig. 5. A closer look at the collaboration network from the upper part of Fig. 5.

Table 2
Network statistics of the authors with 5 or more papers in the sample.

Author	Current affiliation	Publications	Degree	Betweenness
Kallis G.	Universitat Autònoma de Barcelona (Spain)	20	25	212
Koch M.	Lund University (Sweden)	9	3	158
Demaria F.	Universitat Autònoma de Barcelona (Spain)	8	20	770
van den Bergh J.	Universitat Autònoma de Barcelona (Spain)	8	4	380
Drews S.	University of Malaga (Spain)	7	4	236
Martínez-Alier J.	Universitat Autònoma de Barcelona (Spain)	7	8	155
Xue J.	Norwegian University of Life Sciences (Norway)	7	5	5
Alexander S.	Melbourne Sustainable Society Institute (Australia)	6	4	5
Buch-Hansen H.	Copenhagen Business School (Denmark)	6	4	384
Trainer T.	Sydney (Australia)	6	0	0
Gerber J.-F.	Erasmus University Rotterdam (Netherlands)	5	6	236
Heikkurinen P.	University of Helsinki (Finland)	5	4	158
Jackson T.	York University (Canada)	5	3	2
Nesterova I.	Umeå University (Sweden)	5	3	450
O'Neill D.W.	University of Leeds (United Kingdom)	5	2	308
Sekulova F.	Universitat Autònoma de Barcelona (Spain)	5	14	323
Zagonari F.	Università di Bologna (Italy)	5	3	0

already signifies a complete turnover in the community of words used in papers (Drupp et al., 2020). Hence, there is considerable overlap in conceptual vocabulary between clusters 2 (degrowth, culture and power), 3 (flavors of degrowth) and 6 (transition management), as well as between clusters 1 (conceptual foundations), 3 (flavors of degrowth) and 5 (limits to growth) but very little overlap between any of these clusters and clusters 4 (quantitative modeling) and 7 (degrowth perception and communication). Clusters 4 and 5 seem to share some common vocabulary due to their shared foundation in quantitative data and projections. Nonetheless, these findings indicate some conceptual disconnect between clusters 4 and 7 and all other clusters. We suggest that this conceptual disconnect is largely driven by methodological differences between research in cluster 4, 7 and the others, which we see as an indication of a fault line within the body of degrowth literature analyzed here. This hints at a methodological schism within the literature analyzed, which could be explained by ideological differences (in Bromley's understanding of ideology of "an overall view of, or attitude toward, something" (Bromley, 1990, p. 86)) towards economic methodology, a feature that has also been identified for the discipline of economics in general (Lawson, 2015). However, the fact that we find this schism within the body of degrowth literature analyzed is at odds with Lawson (2015) diagnosis that the stance towards quantitative modeling would largely explain what makes economic research 'mainstream' or 'non-mainstream'. Notably, the seven clusters that we identified here in a quantitative manner complement Ott (2012) qualitative diagnosis of 'four variants of degrowth'. Indeed, some of the elements of Ott's clusters clearly correspond to our findings. For example, our clusters 1 (conceptual foundations) and 5 (limits to growth) both share characteristics of Ott's variants 'DG-1' and 'DG-2' (Ott, 2012, 574f), such as exploration of alternatives to GDP and its measurement or a focus on resource limitations and destruction of nature. In frequently focusing on visions and scenarios of Aristotelian ideas of eudaimonia, our third cluster (flavors of degrowth) shares many features of Ott's variant of degrowth 'DG-3' (ibid.), but also the largest fraction of papers that were anti-status-quo or 'anti-system' in tone, more akin to Ott's 'DG-4'. Overall, this variant of degrowth is not as prominent in our sample as the analysis of a survey about attitudes and practices conducted among 814 degrowth scholars at a 2014 conference would suggest (Eversberg and

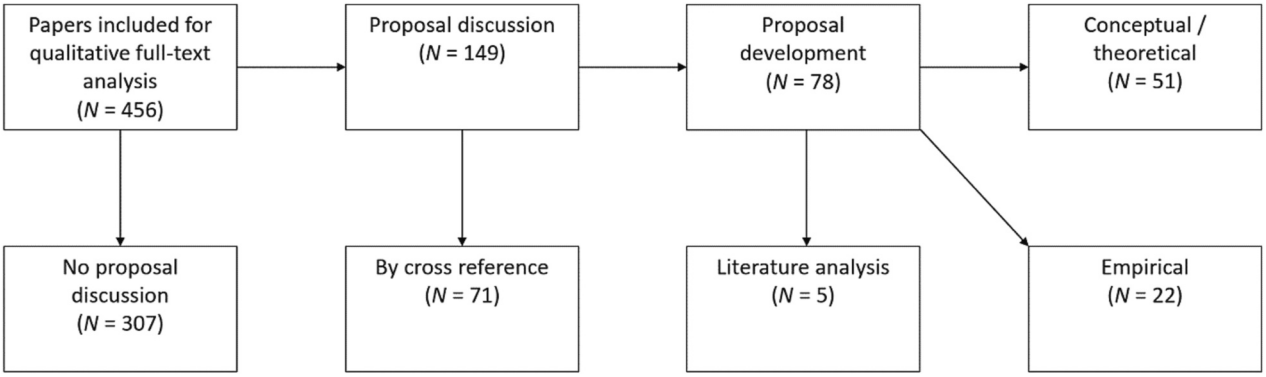

Fig. 6. Abundance of policy proposals in the sample.

Schmelzer, 2018).

Our interpretation of the two main axes of the DCA as representing a methodological (x axis) and a scale-of-analysis gradient (y axis) for the degrowth research landscape coincides with Drupp et al. (2020) findings for the field of 'sustainability economics', and has been a consistent finding in other reviews that used the same methodology on different fields or concepts (Abson et al., 2014; Nüchter et al., 2021).

In terms of cluster dynamics over time, we think that the early years 2008–2015 were characterized by less diverse and more inter-annual variability in scholarship. Since 2016, all clusters have been represented each year and none stands out as particularly dominant. This latter characteristic indicates the onset of a period of consolidation after a relatively brief period of inception. Overall, there seems to be a slight but noticeable trend away from quantitative modeling recently, which is at odds with calls for more formal modeling in degrowth (Weiss and Cattaneo, 2017), for example to highlight well-being benefits of degrowth policies. Similarly, Drupp et al. (2020) have expressed hopes that formal modeling might be a way to bridge divides, but currently it does not seem as if this would likely happen in the near future. One simple reason for this might be that, with much of degrowth research being decidedly 'non-mainstream', formal modeling could simply be too much associated with 'mainstream economics' to serve as much of a bridge-builder in this particular case (see Lawson, 2015). However, we consider the research efforts on how degrowth is perceived and how it should be communicated (cluster 7) as providing a fresh perspective on degrowth. Research in this cluster complements existing research strands that often focus on theoretical discussions of abstract concepts and therefore arguably provide little actionable knowledge on how to help degrowth gain traction outside of a relatively small community.

5.2. Insights from the journal and author analysis

Our analysis of the degrowth research landscape revealed 456 papers that were published in 174 peer-reviewed journals. While we found evidence that a significant amount of papers is published in journals that are part of a relatively recent discipline-specific journal ranking (Mixon and Upadhyaya, 2020), a considerable share of papers (106 papers, or 36.7% of papers from Table 1) is published outside of these journals. On the one hand, this reflects the interdisciplinary nature of most degrowth scholarship, but may also again be a symptom of the schism in economics between 'orthodoxy' (i.e. the 'mainstream') and 'heterodoxy' (i.e. 'pluralist economics'). However, degrowth research that was published in one of the disciplinary journals tended to be published in highly acclaimed journals. Among those publication outlets that were ranked in an economics ranking, only two journals were below the median percentile according to the ranking by Mixon and Upadhyaya (2020) (*European Journal of the History of Economic Thought*, *International Review of Economics*). A considerable share was published in *Ecological Economics*, a journal ranked 22nd among all peer-reviewed economics journals (2020) and rated category B according to *Handelsblatt* (2017) and VHB-JOURQUAL3, which arguably makes that journal a good publishing outlet in economics when measured against the large number of journals in this field. Clusters 3 and 4 had with by far the largest share of such publications (16.3% and 18.0%). The other five clusters all were at a similar level, albeit well below the 10% mark each (cluster 1: 5.9%, cluster 2: 4.2%, cluster 5: 8.7%, cluster 6: 5.2, cluster 7: 3.8%). This finding seems to support the longstanding preference of mathematical formalism and quantitative modeling over other forms of scientific methodology and argumentation in modern economics (Lawson, 2015).

With 20 papers, Kallis was the most prolific author in the period under study by a large margin (Table 2). When looking at individual contributions to clusters, one author (Martínez-Alier) managed to publish in five different clusters with 'just' seven publications, indicating a high degree of conceptual diversity. Institutionally, the most influential researchers on degrowth are largely based in Continental Europe, in particular in Spain (6) and Scandinavia (5). It is worth pointing out that many of the degrowth researchers in this list (Demaria, Drews, Gerber, Kallis, Martínez-Alier, van den Bergh) are, or have been, affiliated with Universitat Autònoma de Barcelona. Thus, the great influence of this "Barcelona School of Ecological Economics and Political Ecology" (see Villamayor-Tomas and Muradian, 2023) on degrowth research is undeniable. Out of the 17 authors with at least five papers in our database, only three have a current affiliation outside of Europe, two of whom are in Australia and one in Canada. This finding is in line with the origins of the degrowth movement in the early 2000s in southern Europe (Demaria et al., 2013; Kallis et al., 2018), but arguably poses a challenge from a diversity point of view, a point well illustrated in the context of AI alignment (Walsh, 2022).

For a still relatively small field of research, degrowth scholarship features a relatively low degree of overall collaboration. The overall network density in our sample is roughly comparable to that found by Abbasi et al. (2011) for the much larger and older research field of "steel structures". This is somewhat counterintuitive, because typically a network's density tends to go down with increasing size. Indeed, many degrowth scholars seem to work with no or at most one or two connections to other scholars (Fig. 4). However, we did find evidence for a sub-group of researchers that collaborate much more densely (cf. Figs. 4 and 5). This sub-network seems to be strongly related to scholars with ties to the "Barcelona School" as all of the central important nodes in this sub-network are affiliated or have been affiliated to Universitat Autònoma de Barcelona.

5.3. Insights from the policy proposal analysis

Our analysis provides strong evidence for a widespread lack of concrete policy proposals in the peer-reviewed scientific literature on degrowth, at least when it comes to monetary and distributional policy. Even though previous studies have also pointed to this (Bonaiuti, 2018;

Demaria et al., 2013; Joutsenvirta, 2016; Parrique, 2020; van den Bergh, 2011), the lack of adequate discussion of concrete policy measures to achieve some of the central goals from the degrowth agenda is rather baffling. It would seem that an academic movement largely concerned with more or less fundamental change of the current politico-economic and social status quo would take a strong interest in development and test of concrete economic policies in line with this agenda. Based on our results however, we have to conclude that there seem to be little such efforts in the peer-reviewed scientific literature on degrowth. Overall, this is a weak point of the academic degrowth movement, because a successful transformation requires knowledge in at least three domains: (1) the current state of things, i.e. how the world *is*; (2) how the world ought to be and (3) the potential ways to get from (1) to (2). These three domains may also be referred to as system knowledge, normative knowledge and transformative knowledge (Abson et al., 2014). Based on our analysis, there is a lack of contributions to the third domain in the current degrowth literature, and possibly also to the first, as we will discuss in the following paragraph. Hence, contributions should be more explicit about the concrete strategies and policies that bring us from the "is" to the "ought to be".

With regard to monetary policy proposals, most papers that contained concrete policy proposals uncritically adopted the existence of a monetary growth imperative as a prerequisite, essentially referring to either Binswanger (2013) or Loehr (2012), both of which are not included in the current study. Some of the papers in this strand concretely discussed alternative or complementary currencies as part of a degrowth economy, and generally did not discuss the monetary growth imperative. The existence of a growth imperative due to a positive interest rate has been a longstanding source of discussion (e.g., Strunz et al., 2017) and is still a contentious issue (Cahen-Fourot, 2022). The idea that there cannot be a steady state with a positive interest rate are either based on the argument that the creditor would want a risk premium in exchange for accepting the risk of default of the debtor (Binswanger, 2013) or on the Keynesian liquidity premium of money (Loehr, 2012). However, a steady-state economy might be possible with a positive interest rate if the problem of excessive capital rents is addressed, i.e. if these rents are redistributed (Cahen-Fourot and Lavoie, 2016; Huth, 2002; Jackson and Victor, 2015; Richters and Siemoneit, 2017). Richters and Siemoneit (2017) also dispute the existence of a growth imperative inherent in the money system itself based on their analysis of five post-Keynesian models. The degrowth literature in our sample can thus be criticized for uncritically accepting the hypothesis that a monetary system based on interest-bearing debt money with private banks would imply a need for ever more economic growth ('monetary growth imperative', MGI for short). Ultimately, this uncritical stance might pave the way for mis-assessment of the current state of things (i.e. how the world *is*, see previous paragraph) and so hamper the potential to identify and articulate viable transformation pathways. It thus remains an open question why the degrowth literature takes the MGI as a given when this is an unresolved question in actuality (e.g., Ferguson, 2018; Richters and Siemoneit, 2019). When it comes to concrete policy proposals, there is a lack of description of new ideas and more focus on discussion of the existing tools.

As evident from the discussion about capital rents, the most promising area of policy proposals for degrowth would be about distribution and redistribution of profits, income and rents. In general, the degrowth literature argues for distributional policies based on equal opportunities. If the economy is shrinking or at least not growing, this should not impede poorer members of society in their opportunities for development, much in line with Raworth's *Doughnut Economy* (Raworth, 2017), in which economies should aim to remain within planetary boundaries while providing minimum standard of living and participation to its individual members. However, while several of the research articles in our database that referred to distributional policies alluded to governmental redistribution of wealth through taxes on income, wealth, and capital, none discussed concrete policies or action plans. The form of transfer payments discussed was either an unconditional basic income/universal basic service (UBI/UBS) or a guaranteed minimum income. Notably, with few exceptions (D'Alessandro et al., 2020; Hirvilammi, 2020; Koch, 2020), we found the discussion about taxation to be largely restricted to taxes on income from labor and capital. For example taxes on land rents were not discussed, which is a remarkable feat, because such taxes seem to play a role in the economic literature on growth imperatives in general (e.g., Schmelzer, 2016 and references therein), but, it seems, usually without direct reference to the term degrowth. The policy proposals made addressed property rights and production factor inputs (Alcott, 2013; Alexander, 2012), and did thus not touch upon distributional policy in the strict sense, which is about redistribution of wealth and income.

The lack of concrete distributional policy proposals in the degrowth literature is an important void. Piketty (2014) has argued for strongly progressive taxes on income from labor and bequests and annual taxes on wealth and income. The optimal tax rates depend on parameters of the distributions, societal preferences (i.e. the social welfare function), and how elastic labor earnings and capital bequests are with respect to the tax rate (Piketty, 2015; Piketty and Saez, 2013). Importantly, the optimal tax rate is always positive and possibly in the order of up to 50–60% based on empirical data (ibid.). Lastly, Piketty (2014, 2015) stresses the vital role of the state in coordinating distributional policies in the form of the modern welfare state and creating transparency about income and wealth dynamics, and argues against progressive consumption taxes as a substitute for progressive taxes on income, inheritance and annual taxes on wealth as proposed by, e.g., Mankiw (2015).

5.4. Robustness of this study

This study was designed to understand the literature surrounding degrowth and postgrowth specifically. As discussed, degrowth began as a social movement with affiliations in academia, especially ecological economics. As the social movement has grown (on social media, general audience books, journalistic reference, and popular culture), so has the academic reference to degrowth. The similarly-concerned steady-state-economics (as social movement or academic field) has not experienced the same expansion as degrowth. Similarly, there is literature that is concerned with the effects of economic growth that is part of neither a social movement nor an academic field. Accordingly, this paper was designed to understand how the academic literature reflects the social movement while also understanding how the social movement influences the academic discourse, specifically with respect to monetary policy and distribution. Owing to the specific focus on the degrowth literature, as emerging from the social movement, this paper offers an analysis of how social movement has been reflected in the peer-reviewed academic literature.

Nevertheless, this approach means that some steady-state-economics literature, and literature concerned with economic growth are not included in the study. While the strength of this paper is its specific focus on degrowth, it is necessary to explore this limitation in order to understand if the present study is weakened by its focus on degrowth. In other words, do academic papers exist that should be included in this study of degrowth that are not by nature of their use steady state?

The term 'steady state' was searched in Scopus in order to understand the impact of its omission from this study. The results were dominated by natural science and ecology literature. While adding 'steady state economics' limited the results, the search was dominated by neoclassical papers discussing steady-state equilibrium.

It is important to add that, 'steady state' was widespread in the ecological economics community long before 'degrowth' became a movement and field. This does not mean the terms 'degrowth', 'postgrowth' and 'steady state' are interchangeable in general, yet some authors do use the terms that way. Two special issues were dedicated to degrowth in the last decade. "Growth, Recession, or Degrowth for Sustainability and Equity?" was published in 2010 by *Journal of Cleaner*

Production and "Degrowth: The Economic Alternative for the Anthropocene" was published in 2013 by *Sustainability*. While some articles in these collections are included in the present study, many discuss the problems of growth, or use 'steady state', and are therefore not included. This includes van den Bergh (2010) who discusses policy in the context of growth-related crises. Yet only, Farley et al.'s "Monetary and Fiscal Policies for a Finite Planet" (Farley et al., 2013) is specifically focused on a concrete monetary policy proposal.

While the papers included in the 'steady state' search are important and relevant, their omission does not materially impact the results of this study. Only Farley et al. (2013) focuses on specific monetary policy proposals in the context of decreased economic throughput. Combining these results with the results of adding 'post growth', this paper's focus on 'degrowth' omits only two relevant policy papers while maintaining the integrity of the original research focus, i.e. the academic representation of the degrowth social movement.

It is also important to understand the literature that does not mention degrowth, post-growth, or steady-state but is nevertheless concerned with economic throughput. This includes a broad monetary growth imperative (MGI) debate that is intimately concerned with economic growth. Further, much work in the degrowth field, including the MGI debate, either using degrowth specifically or not, exists in white papers or books and is thus not included in this study. Finally, there is an emerging body of work in ecological macroeconomics and other topics that are tangential to but do not specifically mention degrowth.

As discussed above, the existence of a MGI in modern economies has been debated since Kennedy (1990) introduced the idea broadly and Binswanger (2009) and Loehr (2012) later formalized the role of debt in a growing economy. This idea was widespread in early ecological economics (Daly, 1994; Douthwaite, 1999; Farley et al., 2013; Soddy, 1930) and is largely associated with concerns over economic growth, but does not mention degrowth specifically. Other literature in the monetary growth imperative debate include the aforementioned post-Keynesian critiques of the MGI Cahen-Fourot and Lavoie (2016), included in the study, and Jackson and Victor (2015), not included in the study. Strunz et al. (2017) and Jackson and Victor (2015) each add to the MGI debate without mentioning degrowth specifically. Arnsperger et al. (2021) have responded to the post-Keynesian critique and, while the publication dates are after 2019, neither would have been identified by the search string since they do not use degrowth and they were published as white papers and essays, something we will turn to now.

Much of the degrowth discussion since 2008 has occurred outside the peer-reviewed literature and instead in white papers, essays, reports, and academic and non-academic books. Due to the nature of the methodology, however, this body of degrowth work is not included in the present study. Svartzman et al. (2020) provide an institutional middle-ground between the MGI and its post-Keynesian critique, but do not use 'degrowth' and is published in an academic book. Other academic books include *Degrowth* Kallis (2017) and *The Case for Degrowth* (2020). Reports in the degrowth grey literature include publications by Positive Money on growth dependency (Boait and Hodgson, 2018) and the problems of growth (Barmes and Boait, 2020). A recent qualitative review that includes grey literature such as this is Fitzpatrick et al. (2022).

There is also a large body of work, specifically in ecological economics, that is tangentially related to degrowth, specifically monetary policy and distribution, but does not explicitly engage with the topic. This includes Ament (2019, 2020) and Svartzman et al. (2019) work on monetary and macroeconomic theory, and Dittmer (2013, 2015) and Dyson et al. (2016) work on banking and monetary policy. Discussing distribution, Stratford (2020) focuses on rent in a resource-limited future while Kallis et al. (2013) focus on the length of the work week. Hartley et al. (2020) specifically discuss distributional implications of Piketty's *Capital* Piketty (2014) when growth rates are low or zero. All of these articles specifically discuss concerns of economic growth but are not included in the study.

As discussed, modifying the search string does not add literature that is focused on the core research topic of monetary policy and distribution. Including search strings, however, does indeed broaden the intended purpose of the study. Had adding 'steady-state', for example, revealed a large monetary policy literature, our paper would have changed its scope. Since that did not occur, we are confident in the findings of this study, that degrowth must engage more deeply with monetary policy and distribution.

6. Conclusions

Academic research under the label of degrowth is a broad field with overall vastly differing approaches, both in terms of methodology and ideology. We have identified seven major clusters of academic peer-reviewed degrowth journal articles, with two clusters, "quantitative modeling" and "degrowth perception and communication", particularly apart from the other five, arguably reflecting the heterogeneity between different but related ecological-economic sub-fields. In terms of paper co-authorships and collaboration, we find evidence for a rather low degree of overall collaboration with the exception of authors representative of the "Barcelona school of ecological economics and political ecology" (Villamayor-Tomas and Muradian, 2023). While some contributions do make or discuss distributional or monetary policy proposals, the majority of papers analyzed here focuses on exploration and development of theoretical concepts. Based on our analysis, we suggest five ways to move degrowth forward as an academic field:

(1) Academic publications on degrowth should give greater attention to discussing the socio-political feasibility of its ideas and proposals including interactions with possible constraints.
(2) The debate about monetary policy within degrowth should focus on wealth distribution in the face of potential monetary drivers of growth.
(3) The debate about distributional policies in a degrowth society should be more prominent and concrete, with a particular focus on proposals for distributional policies that enable a degrowing economy able to sufficiently satisfy human needs and wants.
(4) Contributions to degrowth should aim for a more balanced ratio of conceptual and empirical analyses, ideally combine the two, and focus more on identification and communication of concrete well-being benefits of degrowth policies in order to reach a wider audience (cf. Weiss and Cattaneo, 2017, p. 227).
(5) The recent research efforts on degrowth communication and perception should be intensified, in particular with regard to non-western perspectives.

Recently, researchers have already started to address some of these gaps, for example in papers that connect (modern) monetary theory and degrowth (Olk et al., 2023), or in large-scale research projects that specifically aim at degrowth policies and their implementation (e.g., the "REAL" project by Kallis et al. at Universitat Autònoma de Barcelona, see https://portalrecerca.uab.cat/en/projects/a-post-growth-deal).

While we agree that 'the degrowth movement rightly aims to correct the hypertrophies of modernity' (Strunz and Bartkowski, 2018, p. 1167), there are clear limits to how the current academic peer-reviewed degrowth literature explicates these corrections. We believe that to do so, future degrowth research must engage more deeply with monetary and distributional policies of economies that reduce their energy and resource use.

CRediT authorship contribution statement

John-Oliver Engler: Conceptualization, Formal analysis, Software, Supervision, Writing – original draft, Writing – review & editing, Visualization. **Max-Friedemann Kretschmer:** Conceptualization, Data curation, Investigation, Writing – original draft, Writing – review &

editing. **Julius Rathgens:** Formal analysis, Methodology, Software, Writing – review & editing, Visualization. **Joe A. Ament:** Investigation, Writing – review & editing. **Thomas Huth:** Conceptualization, Supervision. **Henrik von Wehrden:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Supervision, Visualization, Writing – review & editing.

Declaration of competing interest

The authors declare no conflict of interest. This research did not involve human participants and/or animals. No informed consent was needed.

Data availability

Data will be made available on request.

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