

MIGRATION AND DEMOGRAPHIC AGEING NEXUS: A BIBLIOMETRIC APPROACH

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Article History: Received: June 17, 2025; Reviewed: November 20, 2025;

Accepted: December 5, 2025; Available online: December 18, 2025.

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ABSTRACT. International migration and demographic ageing represent two of the most significant social transformations of the 21st century. The interdisciplinary interest shown in these topics reflects the major role of these phenomena in the remodeling of societies, with an emphasis on demographic reconfiguration, structural adaptation, social diversification, recalibration of public strategies and policies, and socio-economic sustainability. The present study performs a bibliometric analysis among a set of 615 articles identified after setting a series of filters in the OpenAlex platform, in order to determine the diversity of fields that have shown interest in the analyzed phenomena, the institutions and sources that have shown proximity in the conceptual approach, the degree of co-authorship between countries, and the identification of scientific communities affiliated with the same schools of thought. The phenomena of migration and demographic transition overcome the barrier of economic and social interest and are found in the concerns of separate fields, such as medicine, urban planning, legislative framework, public policies, production reconfiguration, the healthcare system, the education system, public finances, etc.

Keywords: migration; population; demographic ageing; VOSviewer; bibliometric analysis

JEL classification: J10, J11, J14, J15, O15

Recommended citation: Litra, A.V., Migration and demographic ageing nexus: a bibliometric approach, Studia UBB Negotia, vol. 70, issue 4 (December) 2025, pp. 47-72, <https://doi.org/10.24193/subbnegotia.2025.4.02>

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Introduction

In the last century, many countries have experienced two major demographic phenomena: strong migration and demographic ageing, two manifestations that have reshaped societies and economies. These two phenomena have proven their interdependence and multiple and diverse impact, through the numerous effects they have generated. Thus, migration changes the age composition of the country of departure, through the predominantly young incidence of the phenomenon. The effects of the transformation of the population pyramid are felt in different areas and are perpetuated over time, amplifying as generations change. A population that loses part of its young segment will register a lower future birth rate, a reduced labor force, a deteriorated ratio of the young generation to the elderly people. Already ageing countries will exert a phenomenon of attracting migrants, in order to alleviate the demographic crisis, to cover the labor shortage and stabilize social security systems. Thus, migration determines population ageing, just as population ageing attracts migration.

Migration specific to less developed countries is primarily of young people, which produces a “selective depopulation” (Ourednicek *et al.*, 2011; Carrasco-Cruz & Cruz-Souza, 2025; González Leonardo *et al.*, 2020), leaving behind an unbalanced age pyramid (Micó *et al.*, 2022; Wilson, 2016).

In terms of birth rates, the emigration of young women produces a decrease in fertility in the country of origin, because the incidence of the migratory phenomenon predominantly within young age groups causes the number of women in the fertile contingent in the country of origin to decrease. In destination countries, even if uniform behavioral patterns cannot be defined, many authors observe behavioral adaptation in the sense that migrants show fertility trends more similar to those of the natives from the destination country (García-Pereiro & Paterno, 2025; Lindström *et al.*, 2022; Mussino & Cantalini, 2024).

On the other hand, demographic ageing stimulates migration. Countries experiencing the phenomenon of population ageing require the supplementation of nationally scarce human resources with immigrants in labor-intensive sectors, in the health field, for elderly care, etc. In the financial field, countries with a high percentage of elderly people are experiencing a reduction in the number of contributors to the social security system, simultaneously with the pressure exerted on pension systems. Attracting workforce from immigrants helps to stabilize public finances in the long run (Fiorio *et al.*, 2023; Marinescu *et al.*, 2017; Christl *et al.*, 2022).

For countries of origin, migration is damaging the long-term perspective of the economies, because the low level of the participation rate on the labor market endangers the feasibility of the social, healthcare and pension system (Kurecic *et al.*, 2023)

Although migration may slow down population decline, there is no chance to reverse it (England & Azzopardi-Muscat, 2017; Mayrhuber *et al.*, 2025; Craveiro *et al.*, 2019).

Review of literature

The scientific literature is consistent in works that analyze the interdependence between the two phenomena, as well as the impact they cause in various areas of socio-economic life (Arltová & Langhamrová, 2010; Fihel *et al.*, 2018; Tønnessen & Syse, 2023). In the social sciences, the migration-demographic ageing link is discussed in relation to the impact on family structures and intergenerational relations (Knodel & Chayovan, 2012), cultural diversity, integration of migrant communities, orientation of migratory flows (Hugo & Morén-Alegret, 2008; Stockdale, 2005), development of supporting public policies (Kreager, 2006), modification of living standards (Parr & Guest, 2014).

In economic field, special attention is paid to the combined impact of the two phenomena on the labor market (Behar, 2006; Marois *et al.*, 2019; Ghio *et al.*, 2022; Fuchs, 2015). Filling the labor shortage generated by the ageing population through immigration, the sustainability of tax and pension systems (Nicolae & Amalia, 2020; Bogataj *et al.*, 2020; Mencinger, 2008; Boboc & Voineagu, 2008), changes in the structure of consumption and consequently production (Serhiienko *et al.*, 2025), the contribution of migrants to economic growth, are just a few of the current concerns (Heinz & Ward-Warmedinger, 2006; Bloom *et al.*, 2010; Beets, 2010).

Demographic literature studies the change in the structure of the population by age groups in the presence of migratory flows (Bernhardt, 2004), urbanization and depopulation (Cividino *et al.*, 2020; Nancu *et al.*, 2011; Majdzińska, 2024; Josipovič, 2024; Jelić *et al.*, 2019), and develops demographic projections regarding future population evolutions (Li *et al.*, 2009; Newsham & Rowe, 2019; Tsimbos, 2008).

In the field of public health, the transformation of societies as a result of ageing shifts attention to the problems of the third age, to the emergence of “active ageing” and “healthy ageing” as a solution to prolonging working life and alleviating the labor shortage. The role of migrants in the health system is considered in the context of the increasing need for health services related to the increase in the elderly population (Cela & Barbiano di Belgiojoso, 2019; Mujahid, 2007). The health sector must adapt the health infrastructure, treatment and care modalities to the specific needs, types of diseases and characteristics of a demographically ageing population (Moller, 2002; Tang & Xie, 2021).

Political science and European studies evaluate migration policies, regulations on international mobility, strategies for inclusion of migrants (Green, 2007), political tensions determined by demographic changes, climate change (Harper, 2103; Wang *et al.*, 2019), changes in the education system (Cortina, 2013). Studies in the field of law analyze the legal framework and protection of migrants' rights (Straubhaar, 2006; Schultz, 2018), or social protection of the elderly (Bloom & McKinnon, 2010; Parsons & Gilmour, 2018).

In engineering sciences, the transformation of society as a result of demographic changes is approached in various forms, from technical solutions for replacing the productive activity of the labor force with technology, to the creation of technologies to support the elderly in various fields (Pathak & Mehul, 2012).

Research methodology

In order to collect the necessary data for the analysis, the OpenAlex platform was used, which is a bibliographic catalogue of scientific works, starting operating in 2022 by OurResearch as a successor to the terminated Microsoft Academic Graph.

In the first stage, the approximately 272.6 million works in the OpenAlex database (at the time of platform query - November 2025) were sorted using the "migration" "population" "demographic" "ageing" filter in the title&abstract, returning a number of 1046 results.

The form "ageing" was preferred, not "aging", because the former is used predominantly in British English, more common in Europe, while the form "aging" is common in American English, and therefore used predominantly in the US. This paper proposes an analysis of the specialized literature mainly focused on the specific case of European states, which are simultaneously going through both massive migration and a pronounced stage of demographic ageing.

Subsequently, the sorting continued by applying the "article" type filter, thus waiving the inclusion in the bibliometric analysis of works such as: book, book chapter, preprint, dissertation, review, editorial, etc. Subsequently, 735 articles were returned.

Finally, the English content filter was applied, so that the results could be verified from the point of view of the subject overlap over the research topic, with 650 results being returned, and the last stage consisted in selecting a reasonable interval of a quarter of a century, the period 2000-2025. This period was applied after the scientific production of the years prior to 2000 was analyzed, and it was found that it did not exceed a maximum of 5 articles per

year, while some years recorded zero production. The final number of results obtained after applying the 4 types of filters was 615 articles. Of these, 381 articles (representing 62%) were in open access.

Results and discussions

As stated before, searching and filtering in the OpenAlex database of article-type publications written in English, published in the period 2000 – 2025, using the keywords “migration” “population” “demographic” “ageing” returned a number of 615 scientific articles.

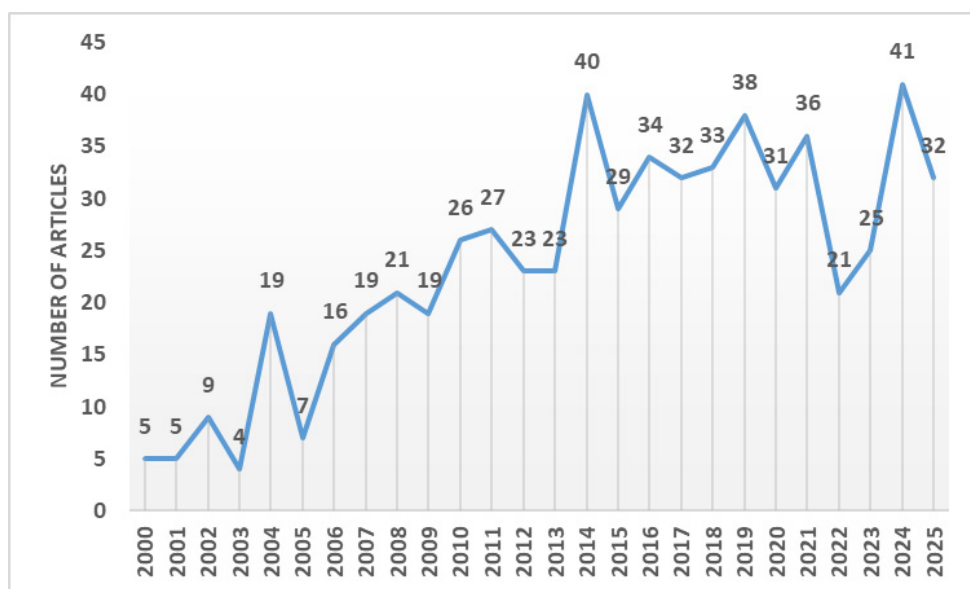


Figure 1. Evolution of the number of articles by year of publication

Source: Author's elaboration

The evolution of the number of articles published in the analyzed interval is relevant for the intensification of concerns in the field of interdependence between the phenomena of migration and demographic ageing. Compared to the beginning of the period, the number of articles multiplies towards the end of the period by 7-8 times, annually (Figure 1).

A look at the most frequent primary topics in the analyzed list of articles also reflects an area of concern related to population ageing and migration. By their nature being demographic phenomena, which relate to the social side of a

society, the developments recorded by these phenomena also had effects in areas partially or very little related to this field. Concerns arise related to the labor market, health care, health disparities, regional development, rural development, urbanization and city planning, environment, energy, climate adaptation, retirement and disability, mortality – insurance and risk management, family dynamics, economic growth, productivity, fiscal policy, global trade, tourism, land use, education systems, migration: refugees and integration, welfare studies, etc.

The figure below (Figure 2) reflects a synthesis of the most addressed primary topics, which exceeded the threshold of 10 articles per topic. In total, the number of primary topics associated with the analyzed sample of articles was 145, of which only 13 are shown in the figure below. The rest, although they had an incidence of 1 to a maximum of 9 articles, are interesting and relevant to the way in which the demographic and social transformation of a society has repercussions in extremely distant fields, such as: Military and Defense Studies, Aviation Industry Analysis and Trends, Agriculture Sustainability and Environmental Impact, Disaster Management and Resilience, Urban Transport and Accessibility, Assistive Technology in Communication and Mobility, Employment and Welfare Studies, Psychiatric Care and Mental Health Services, Youth Education and Societal Dynamics, Elder Abuse and Neglect, Urban Neighborhood and Segregation Studies, etc.

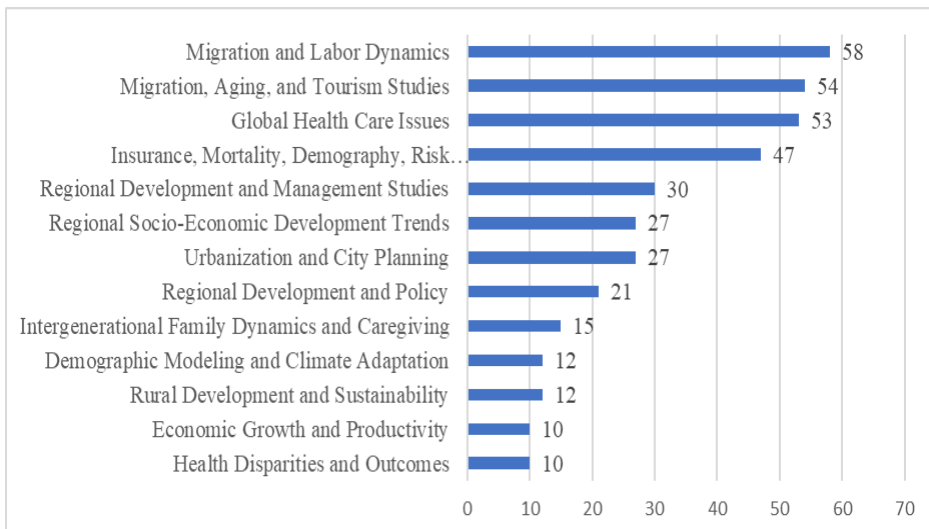


Figure 2. Number of articles by primary topic

Source: Author's elaboration

Regarding authorships institutions, a total of 200 institutions were returned, none of which having a very high number of authors affiliated with the institution. The maximum of 8 was assigned to the University of Queensland, 7 authors affiliated to the Russian Academy of Sciences, and 7 to the University of Groningen, but over 70 institutions were listed with only one affiliated author.

After sorting articles by the number of citations recorded, the result of selecting the 10 most cited articles is presented in the table below. Even though the number of citations is often a temporal attribute, and it is natural for older publications to accumulate a higher number of citations, which disadvantages recent publications, recording a number of several hundred citations is an attribute that only a reference publication can possess.

The themes addressed by these highly cited articles were diverse, starting from the subject of urbanization, land use, generational interaction, health and healthcare system, given that all these themes had as a background the social transformation that current societies are going through, against the background of demographic ageing and in the presence of the international migratory phenomenon.

Table 1. Top 10 articles by number of citations

No.	Title	Authors	Publication year	Cited by count
1	Profile: Agincourt Health and Socio-demographic Surveillance System	Kathleen Kahn, Mark Collinson, F. Xavier Gómez-Olivé, Obed Mokoena, Rhian Twine, Paul Mee, Segun Afolabi, Burton D. Clark, Chodziwadziwa Kabudula, Audrey Khosa, Siyabonga Khoza, Mildred Shabangu, Bernard Silaule, Jeffrey Tibane, Ryan G. Wagner, Michel L. Garenne, Samuel J. Clark, Stephen Tollman	2012	520
2	Urban growth and decline: Europe's shrinking cities in a comparative perspective 1990-2010	Manuel Wolff, Thorsten Wiechmann	2017	327
3	Health and health-care systems in southeast Asia: diversity and transitions	Virasakdi Chongsuvivatwong, Kai Hong Phua, Mui Teng Yap, Nicola S. Pocock, Jamal Hisham Hashim, Rethy K. Chhem, Siswanto Agus Wilopo, Alan D. López	2011	310

No.	Title	Authors	Publication year	Cited by count
4	Splintering Urban Populations: Emergent Landscapes of Reurbanisation in Four European Cities	Stefan Buzar, Philip E. Ogden, Ray Hall, Annegret Haase, Sigrun Kabisch, Annett Steinführer	2007	291
5	The Myth of generational conflict: the family and state in ageing societies	Sara Arber, Claudine Attias-Donfut	2001	245
6	Grey matter: ageing in developing countries	Priya Shetty	2012	219
7	Why we don't have to believe without doubting in the "Second Demographic Transition" - some agnostic comments.	David Coleman	2004	147
8	Replacement migration, or why everyone is going to have to live in Korea: a fable for our times from the United Nations	D. A. Coleman	2002	100
9	Does demographic change affect land use patterns?	Franziska Kroll, Dagmar Haase	2009	97
10	Demographic trends and public health in Europe	Kathleen England, Natasha Azzopardi-Muscat	2017	95

Source: Author' s elaboration

Thus, adult health, ageing, migration and urbanization were main factors taken into account in the creation of a system (HDSS) for monitoring and investigating the causes and effects of complex health, population and social transition in rural northeast South Africa (Kahn *et al.*, 2012).

Against the backdrop of an increasingly ageing population and an internal migration from underdeveloped to more competitive locations, which has been strongly evident since the beginning of the 21st century, Wolff & Wiechmann (2017) investigate the influence of economic and demographic drivers on the non-linear evolution of shrinking cities in Europe, finding that the shrinkage of the European cities was 4 times more intense after 2010 than during the period 1990-2010.

Ageing population challenges are presented in a medical context, in the case of regions that are strongly disparate in terms of social, economic and political criteria, such as Southeast Asia (Chongsuvivatwong *et al.*, 2011). Socioeconomic development diversity has overlapped with differing rates of demographic transitions, health disparities, migration of the health workforce, posing health challenges for national health systems.

In the particular case of 4 European cities, Buzar *et al.*, (2007) investigated the demographic contingencies of this process-also known as reurbanisation, revealing that the analysed cities experienced multiple migration trends and new household structures connected to the second demographic transition (within which population ageing is a key indicator). However, this concept of “second demographic transition” is only partially relevant, as long as the behaviour regarding cohabitation, births outside marriage, number of children, remain highly heterogeneous between populations. However, except for the migration, population growth is considered to be over (Coleman, 2004).

Arber & Attias-Donfut (2001) addresses theoretical and policy issues connecting age and intergenerational relations, against the background of the transformations of Western societies, marked by the ageing population, the role of women in the family and in relation to older people, migration, urbanisation and welfare provision changes.

Shetty (2012) noted that the same economic progress that is leading to better life expectancies is also a factor in the intensification of migration and urbanization. Developing countries that are currently experiencing rapid ageing will need to learn from developed countries how to manage social systems for an elderly population for which the younger generation no longer represents care-providers, and they may not even live in the same country as their parents do.

Although future management of population decline and ageing will find a suitable response in international migration, it only prevents population ageing at unsustainable levels, without finding a “solution” to this problem, which is considered to be largely inevitable (Coleman, 2002).

Kroll & Haase (2010) found a correlation in most growing regions in the West of Germany between land use, natural population growth and net-migration. Regarding land use change in the shrinking regions in the East of Germany, economic variables proved to be highly important.

Integration of VOSviewer software results in the bibliometric analysis

The VOSviewer software was used to study the links between authors, concepts, works, sources, organizations and countries. VOSviewer is a software tool used in constructing and visualizing bibliometric networks, whose output

consists of network and density maps that allow the graphic representation of connections that are otherwise difficult to interpret only from structuring data in tables. In the present study, the software was used to generate maps with the aim of identifying co-authorship (collaboration) between authors, organizations and countries; with the aim of identifying bibliographic coupling (documents/sources/organizations/countries), as an indicator of the similarity between two items from the perspective of the number of references that both share; but especially, the co-occurrence of concepts map, which allows the identification of related domains by visualizing the frequency of occurrence of key concepts in them. VOSviewer automatically normalizes labels to lowercase, regardless of whether they refer to countries, institutions, titles, keywords, etc.

Starting from the initial keywords, the collection of the 615 articles constituting the object of the analysis and processing them in the VOSviewer software with the co-occurrence of the concepts option generated a map of words extracted from titles, abstracts or keywords, which reflect the favorite themes corresponding to the set of articles analyzed (Figure 3).

A threshold of 10 was used for the minimum number of occurrences of a keyword, so that the map reflects the most significant results. Thus, of the 900 keywords identified, 138 corresponded to this criterion. The map obtained groups the keywords into 6 clusters, which are detailed below. 5759 links between clusters were recorded, with a TLS indicator of 53683.

Each circle marked on the map is associated with a keyword, a concept that appeared in connection with the keywords defined in the collection of articles relevant to the field. The size of the node is relevant to the frequency of occurrence of the concept in the analyzed articles, and therefore to the connection that the concepts visible on the map present in relation to the theme of migration and demographic ageing. The links between the concepts, materialized in lines, are the result of the co-occurrence of the two concepts in the same article, the thickness of the lines indicating whether the degree of association is strong or weak.

Furthermore, the algorithm of the VOSviewer software (VOS mapping) allocates the nodes on the map in a closer position for the case of strong links, which are thematically related, or more peripheral for the weakly connected ones, belonging to different domains. Therefore, the central themes are the most connected ones.

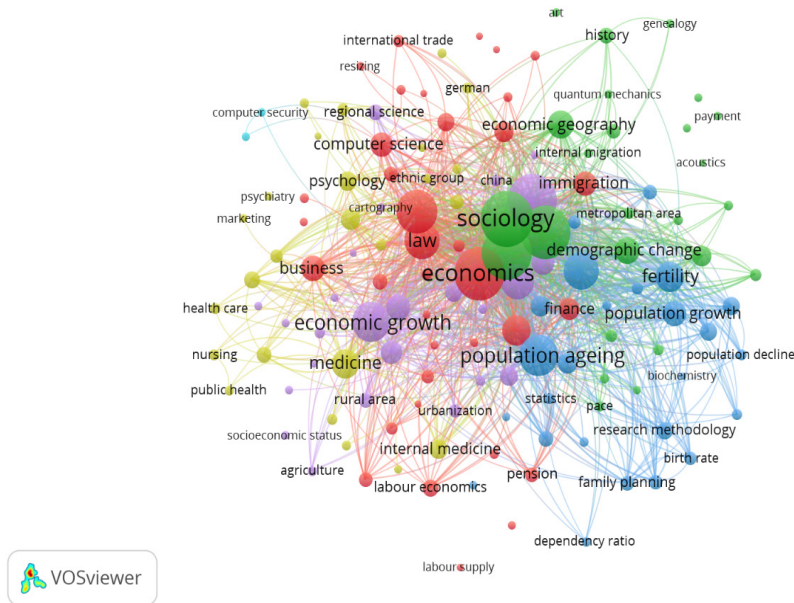


Figure 3. Co-occurrence of the concepts – network visualization

Source: Author' s elaboration using VOSviewer software

Since the minimum 10 occurrences of a keyword setting was used, keywords that have at least this frequency of occurrence (in the title, abstract or keywords list of the articles) appear on the map and in the detailed cluster table. The positive aspect of setting a higher occurrence is the generation of a more airy map, with more strongly connected concepts and better visibility of the links. For this reason, the table below presents the 6 clusters that were generated following the analysis of the co-occurrence of concepts with the VOSviewer software, each cluster grouping the concepts from the point of view of identifying their belonging to the same conceptual domain or theme in the analyzed literature.

Table 2. The main clusters, frequent keywords and occurrences

	Cluster (general domain)	Colour	Total items	Frequent keywords and occurrences
1.	ECONOMICS POLITICS	Red	36	economics (425), political science (294), law (211), development economics (143), computer science (92), business (103), immigration (90), finance (70), politics (67), European Union (52), labour economics (43), engineering (39), government (36), economic policy (35), pension (33), market economy (30)
2.	SOCIOLOGY DEMOGRAPHY	Green	25	sociology (466), population (436), demography (431), economic geography (120), demographic change (105), demographic transition (67), history (37), human/internal migration (23)
3.	DEMOGRAPHIC ECONOMICS	Blue	25	population ageing (264), demographic economics (211), fertility (136), population growth (96), ageing (67), population projection (67), mathematics (65), net migration rate (50), life expectancy (42), emigration (35), family planning (35), total fertility rate (33), birth rate (31), mathematical analysis (30)
4.	MEDICINE	Yellow	25	medicine (132), context (63), psychology (62), internal medicine (57), gerontology (48), environmental health (37), social science (34), workforce (27)
5.	ECONOMIC GROWTH	Purple	25	geography (405), economic growth (246), archaeology (194), philosophy (103), biology (88), linguistics (84), socioeconomics (58), ecology (54), regional science (37), rural area (33), urbanization (28)

Source: Author' s elaboration

The negative aspect of using high-frequency concepts is that concepts with a lower occurrence are ignored, but they reflect a wider thematic area of the articles. Their visualization outline a more complete picture of the concerns that the associated topic of migration and demographic ageing brings even in fields more distant from the one studied. Keywords such as: oceanography; theology; refugee; aesthetics; rural population; urban agglomeration; environmental resource management; aerospace engineering; democracy; epidemiological transition; consumption; climate change; cultural diversity; multiculturalism; public administration; accounting; chemistry; geometry; transport engineering, etc., are evidence of various research fields, delimited by that of migration or demographic ageing, but which have shown scientific interest in issues connected to them.

In the overlay visualization (Figure 4), the assignment of colors is no longer done according to the thematic cluster, as in the network visualization. The color is a numerical attribute that is assigned in relation to the Average Publication Year indicator. The terms in cold colors (blue) are the terms that appear earlier, at the beginning of the analyzed interval, the terms in green are in the middle of the interval, and those in yellow are new in the literature. The map thus obtained provides an image of the degree of well-known or, on the contrary, new approach in the topic of migration and demographic ageing. And, more than that, the way in which this topical theme has been addressed in various fields, reflecting the incidence that these economic and social phenomena have on aspects in extremely diverse fields. The color transition reflects the conceptual evolution of the field.

In the topic of consecrated fields there are keywords such as: fertility, demographic transition, population growth, family planning, total fertility rate, history, genealogy, immigration policy, economic policy, etc. In the area of novelty, the field of migration and demographic ageing was linked to topics such as: regional science; marketing; psychology; pathology; neuroscience; environmental planning; sustainable development; sustainability; regional science; public health; tourism; statistics; econometrics; acoustics; internal migration; mathematics, etc.

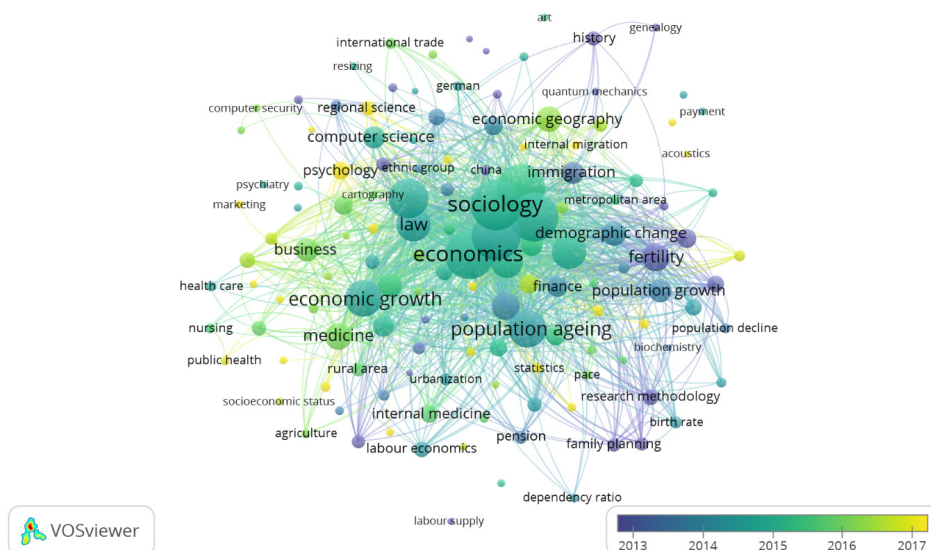


Figure 4. Co-occurrence of the concepts – overlay visualization

Source: Author's elaboration using VOSviewer software

The co-authorship between countries map (Figure 5) shows how the scientific production of the analyzed topic is a result of the collaboration between researchers from different countries. The size of the nodes is proportional to the total number of publications of that country, also the thickness of the lines reflects intense or occasional collaboration. Centrally located countries are the most connected, while marginally located countries are less engaged in scientific collaboration.

The grouping of countries into clusters reflects the group of countries that have collaborated intensively with each other in that field.

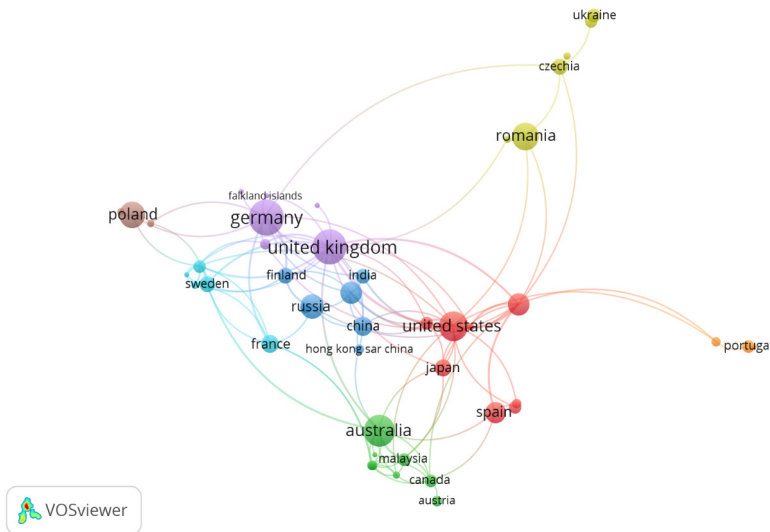


Figure 5. Co-authorship between countries

Source: Author' s elaboration using VOSviewer software

Generating the co-authorship – countries map returned 71 countries, of which 46 proved to be interconnected, these being the countries included in the final document. They were grouped into 8 clusters, as follows:

Cluster 1 (red): USA (with the highest number of documents: 28); Hungary; Italy; Japan; Latvia; Lithuania; New Zealand; Spain.

Cluster 2 (green): Australia (with the highest number of documents: 31); Austria; Canada; Greece; Indonesia; Malaysia; Singapore; Thailand.

Cluster 3 (blue): Russia (with the highest number of documents: 19); China; Finland; Hong Kong; India; Netherlands; Tajikistan.

Cluster 4 (yellow): Romania (with the highest number of documents: 23); Czechia; Moldova; Norway; Slovakia; Ukraine.

Cluster 5 (purple): Germany (with the highest number of documents: 39); United Kingdom (38); Belgium; Falkland Islands; Ireland; Israel.

Cluster 6 (light blue): France (with the highest number of documents: 11); Ghana; Sierra Leone; South Africa; Sweden.

Cluster 7 (orange): Portugal (with the highest number of documents: 5); Brazil; Switzerland.

Cluster 8 (brown): Poland (with the highest number of documents: 22); Denmark; Vietnam.

The map of bibliographic coupling of the documents (Figure 6) associates articles that share bibliographic sources. The stronger the connection between them, the greater the number of common references.

Documents symbolized by large nodes, centrally located, and connected with thick lines, are those that share the most common references. The grouping into differently colored clusters is done based on the criterion of the number of common references, delimiting groups of documents that fall into the same sub-theme within the field, or that of using the same theoretical framework, or that of being affiliated with the same scientific community.

The most pronounced nodes are the documents that have constituted major bibliographical landmarks for subsequent publications.

Figure 6 was generated after setting a minimum limit of 7 citations of a document. Of the 615 documents analyzed, 188 meet the threshold. The largest set of connected documents consisted of 140 items, grouped in 14 clusters.

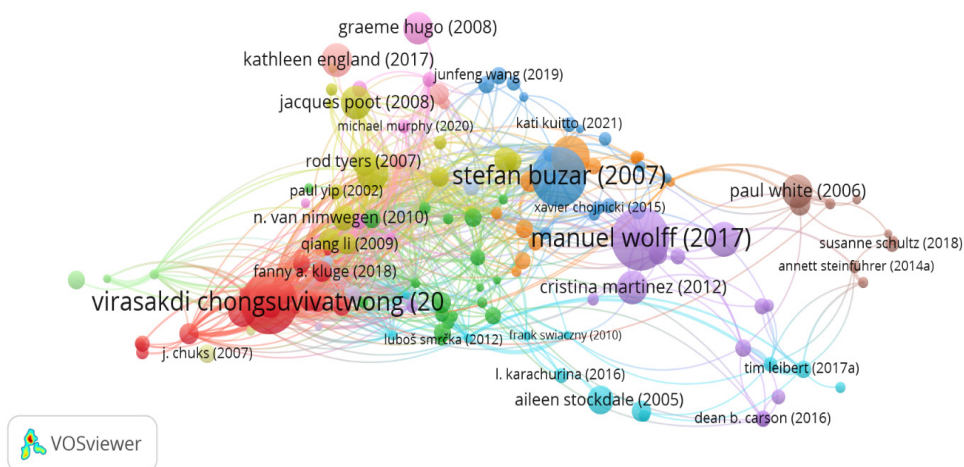


Figure 6. Bibliographic coupling between documents – network visualization

Source: Author's elaboration using VOSviewer software

In the overlay visualization (Figure 7), using the average year of publication option, it can be observed the evolution of subtopics over time, from the blue areas that represent reference scientific production, capitalized at the beginning of the analyzed period, to the yellow points, of recent date, which have not yet had time to be capitalized very much, but which signal new lines of research, emerging directions in the field. The large size of the nodes is relevant to the importance of the documents in the represented field, and the distances between them reflect the degree of bibliographic similarity and therefore aligning with the same scientific approach.

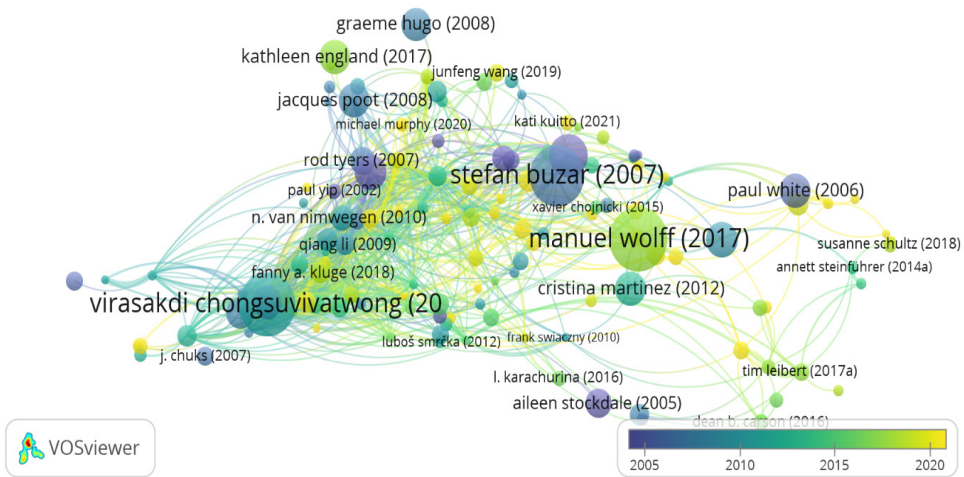


Figure 7: Bibliographic coupling between documents – overlay visualization

Source: Author's elaboration using VOSviewer software

The bibliographic coupling map of the sources (Figure 8) highlights the bibliographic links established between the journals that contributed to the scientific production of the analyzed field. Of the 357 sources identified in the publication of the analyzed articles, 63 met the set threshold of at least 2 documents, with at least 1 citation, and the largest set of connected items was identified at 47 items, grouped into 7 clusters. Thus, clustering (colors), node size, link thickness and distances between sources are relevant indicators of the degree to which scientific journals are closer or more differentiated thematically, with the identification of centers of influence, the groups of journals that deal with common topics, or the journals with peripheral positioning in the scientific publishing community.

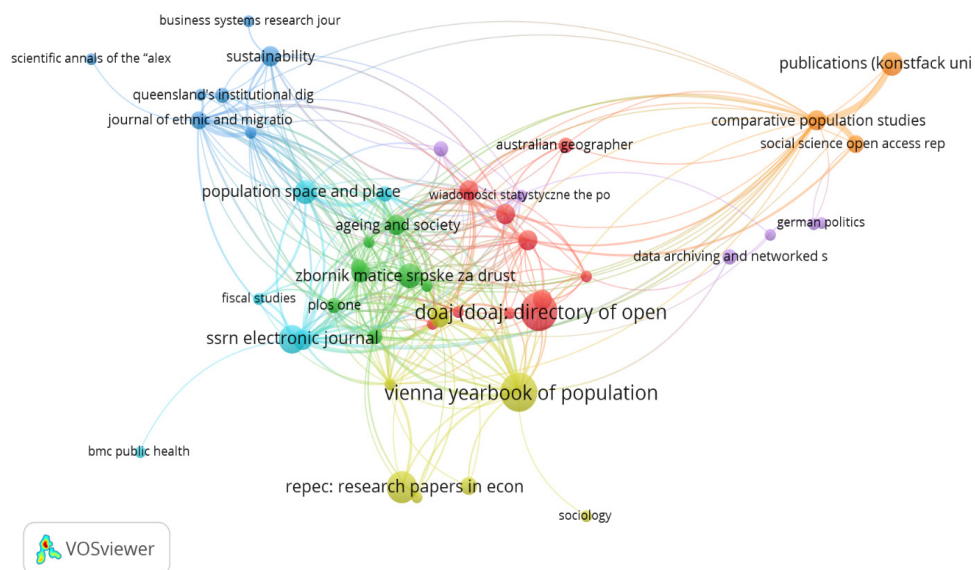


Figure 8. Bibliographic coupling between sources

Source: Author's elaboration using VOSviewer software

Similarly, the bibliographic coupling map at the organizations level identifies the incidence of situations in which researchers from two different institutions cite the same works in their publications. Even if they do not collaborate directly, organizations can be assimilated to a common theme from the point of view of the common number of references of their own scientific publications production.

In order to perform a sorting of organizations, taking into account the large number identified in the analyzed sample – 409 organizations, they were filtered, retaining only those with at least 3 documents published in the analyzed field, and the threshold of at least 3 citations. 33 organizations were thus generated, and on the map below (Figure 9) the thematic proximity between the institutions involved in scientific production can be visualized. The colored clusters (7 in number) can be an indicator of subdomains or schools of thought, grouping institutions with similar thematic orientations, and their positioning shows the degree of conceptual similarity, with organizations close in representation sharing similar bibliographic bases.

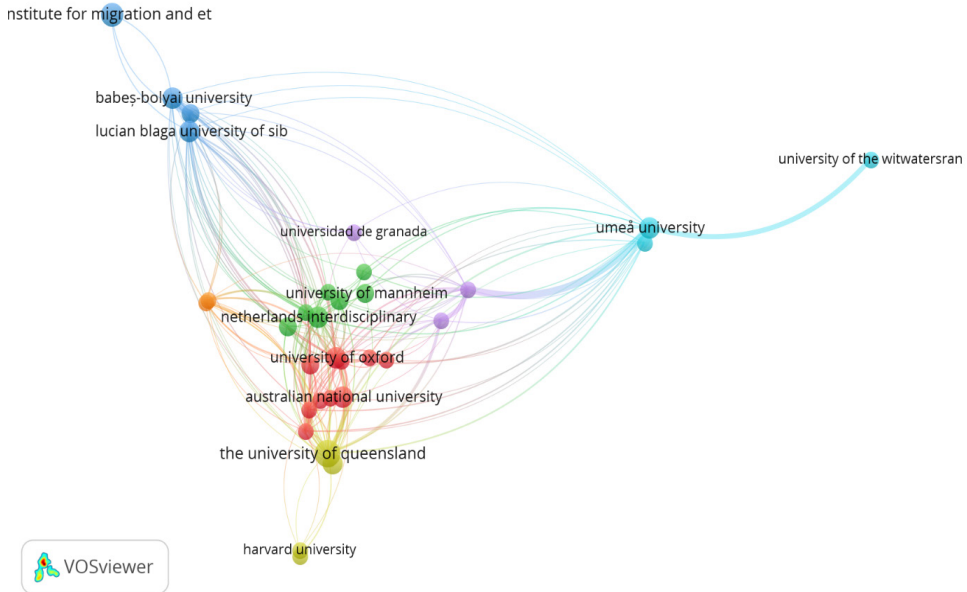


Figure 9. Bibliographic coupling between organizations

Source: Author' s elaboration using VOSviewer software

The allocation of countries according to the degree of thematic proximity in the scientific production of the field can be visualized in the bibliographic coupling of the countries map (Figure 10). Even if two countries have never published together, they can be highly coupled when working in the same field and adhering to the same bibliographic sources.

Therefore, the map is not one of international collaboration, but one of similarity in the conceptual approach to the research topic.

The identified clusters (6 in number) may reflect common academic traditions, regions with similar research interests, currents of thought to which different countries have adhered.

Cluster 1 (red): 7 countries: Germany, United Kingdom, United States, Netherlands, Serbia, India, Slovenia

Cluster 2 (green): 5 countries: Romania, Italy, Spain, Croatia, Lithuania

Cluster 3 (blue): 5 countries: Poland, France, Sweden, Finland, South Africa

Cluster 4 (yellow): 4 countries: Russia, China, Japan, New Zealand

Cluster 5 (purple): 4 countries: Czechia, Ukraine, Portugal, Slovakia

Cluster 6 (light blue): 3 countries: Australia, Canada, Malaysia

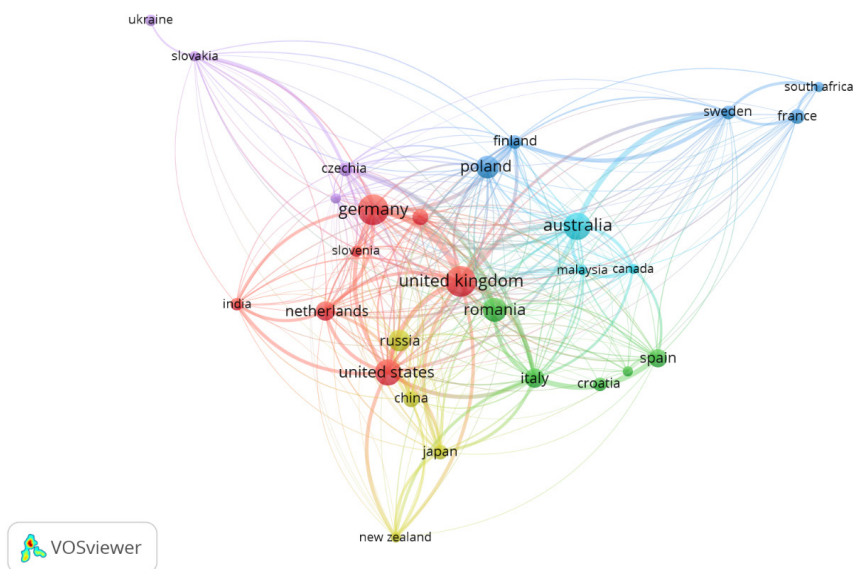


Figure 10. Bibliographic coupling between countries

Source: Author' s elaboration using VOSviewer software

Conclusions

The paper aims to reviewing the specialized literature focused on the connection between international migration and demographic ageing. The analysis carried out finds an increase in scientific concerns on the combined topic of international migration and demographic ageing, as a confirmation of the connection between transnational mobility, population structure and public policies. As the main findings of the study, the paper identifies two major characteristics: on the one hand, the concentration of research topics in certain conceptual clusters (labor mobility, healthcare system transformations, public finance challenges, pension system sustainability, changing consumption needs structure, social integration, redefinition of intergenerational relations, etc.), highlighting the areas of attention of the scientific community, which can guide future research; on the other hand, the emergence of concerns regarding the two phenomena in research areas strongly delimited from the first, manifesting itself in an alarm signal of the implications that societal transformations cause on multiple levels.

A polarization of the literature is observed on several main levels: the impact of migration on the demographic structure of the country of origin, the role of migration in mitigating the effects of ageing, the economic impact of migration, the implications of migration on the elderly. However, interdisciplinary works, which project the issue of the incidence of the two phenomena in distant scientific areas, which go beyond the socio-demo-economic character of the topic, reflect the increasing degree of concern regarding the management of the effects felt as a result of the strong manifestation of the two phenomena during the last century. The study identified the combined issues of international migration and demographic ageing in emerging topics such as: urbanization and city planning, rural developments and sustainability, demographic modeling and climate adaptation, coastal and marine management, land use and ecosystem services, aviation industry analysis and trends, disaster management and resilience, military and defense studies, law and migration, housing market, intergenerational family dynamics and caregiving, ageing and gerontology research, technology use by older adults, assistive technology in communication and mobility, old age disorders, mental health in a transforming society, youth education and societal dynamics, tourism and development, etc.

Observing the geographical distribution of publications, as well as the international collaboration of researchers, helps to identify areas that show intense concerns related to the developments, implications and solutions of these problems; other areas are less well represented, with implications for knowledge transfer and the formulation of public policies. The research results can help decision-makers in becoming aware of and understanding the transformations of society from the perspective of the two phenomena studied, identifying possibilities for intervention to support and correct their effects.

The application of VOSviewer allows a clear visualization of co-citation, co-authorship and co-occurrence networks of keywords, which brings a detailed perspective on the structure of knowledge. The paper contributes to the research domain by identifying dominant trends, emerging themes, as well as scientific collaboration structures. The use of maps generated by the VOSviewer software highlighted thematic clusters based on keywords and the evolution of interest over time in extremely diverse emerging research topics. The bibliographic coupling analysis allowed the visualization of intellectual similarity based on the references used, highlighting schools of thought and articles considered as reference points, as a result of the number of citations recorded. The collaboration of the authors could be delimited according to the country or institution of origin. The study can function as a reference point for researchers, providing a solid basis for understanding the literature and facilitating orientation towards insufficiently explored subtopics.

This study does have some limitations. The bibliometric analysis depends on the database used (OpenAlex platform), which means that scientific products indexed in other sources may be omitted. The choice of search criteria (keywords, period, document types) can influence the results and the structure of the clusters. The study does not assess in depth the opinions addressed in the included publications, but only the bibliometric relationships between them.

As future research directions, the analysis can be extended by including other databases for a broader coverage, and by adding keywords that allow a more rigorous filtering of the sample of papers. The research can be extended by investigating the identified clusters in depth, in order to understand the thematic developments and the conceptual connections behind them. Comparative analyses can be carried out between countries or development areas, in order to observe the different ways in which migration and ageing are addressed in the scientific literature, in order to observe the particularities of manifestation of the phenomena and to identify solutions adapted to them. Another research direction can consist in exploring the emerging themes identified for the development of new conceptual frameworks.

The scientific literature dedicated to the current issue of migration and demographic transition is rich and complex. Even if a strong segmentation can be observed between researchers in the demo-economic field, and those in the medical field, engineering, law, etc., the analyzed phenomena create a scientific bridge that can be capitalized only through the combined effort of specialists regardless of the field. There is appreciable potential for capitalization in using the results of research in this field and applying them to develop macroeconomic policies of stabilization, equilibrium and resilience, targeting effects at the microeconomic level: protection, adaptation, integration.

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