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GEORGE DOS REIS ALBA

THE RISE OF BEHAVIORAL ECONOMICS ON MAINSTREAM ECONOMIC JOURNALS: A BIBLIOMETRIC STUDY

Porto Alegre
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Trabalho de conclusão submetido ao curso de Graduação de Ciências Econômicas da Faculdade de Ciências Econômicas da Universidade Federal do Rio Grande do Sul, como requisito parcial para obtenção do título de Bacharel em Ciências Econômicas.

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ABSTRACT

In the last decades, mainstream economics has recognized behavioral economics, conquering spaces in environments where “rational choice” approaches linked to the neoclassical tradition almost always walked alone. The objective of the present work is to establish an overview of the behavioral economics literature in the leading economics journals. Through bibliometrics, publications in behavioral economics are evaluated, considering the most scientifically relevant authors, institutions, and countries, their evolution as a discipline, and current trends. More specifically, we seek a better understanding of “who,” “what,” “how much,” and “how” research in behavioral economics has been gaining ground in more traditional publications in economic sciences. Behavioral economics is present in 29 top 30 mainstream journals, with a prominent role in the American Economic Review. Evidence for the dominance of publications in behavioral economics by institutions and authors from US institutions is also presented, among which the universities of Harvard, Berkeley, and Chicago stand out.

Keywords: Behavioral economics, mainstream economics, bibliometrics, economic journals, evolution.

JEL codes: D9, E7, B21, B22.

RESUMO

Nas últimas décadas, a economia comportamental vem sendo reconhecida pela economia *mainstream*, conquistando espaços em ambientes onde as abordagens do tipo "escolha racional" ligadas à tradição neoclássica quase sempre andaram sozinhas. O objetivo do presente trabalho é estabelecer um panorama da literatura de economia comportamental nos principais periódicos de economia. Por meio de uma bibliometria, avalia-se as publicações de economia comportamental, considerando autores, instituições e países cientificamente mais relevantes, bem como a sua evolução como disciplina e tendências atuais. Mais especificamente, busca-se uma melhor compreensão sobre "quem", "o que", "quanto" e "como" a pesquisa em economia comportamental vem ganhando espaço nas publicações mais tradicionais das ciências econômicas. A economia comportamental se faz presente em 29 dos 30 melhores periódicos do *mainstream*, com papel de destaque para a *American Economic Review*. Apresentam-se também evidências para a dominância da publicação em economia comportamental de instituições e autores provenientes de instituições dos EUA, das quais sobressaem as universidades de Harvard, Berkeley e Chicago.

Palavras-chave: Economia comportamental, economia *mainstream*, bibliometria, periódicos de economia, evolução.

Códigos JEL: D9, E7, B21, B22.

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SUMMARY

1. INTRODUCTION

The frontiers of economics have shown specific permeability, changing with the expansion of its domain over the other social sciences and with the influence of other scientific fields, such as psychology. These changes compromise the definition of the scope and limits of economic sciences, in addition to making it difficult to understand its divisions and internal hierarchies.

One of the significant changes that the economic sciences have been undergoing, with consequences for how knowledge is organized within the discipline, is the emergence and growth of behavioral economics. The progress of this research has been so spectacular that it raises the question of whether it can be considered part of mainstream economics (Dequech, 2007). A great indication that behavioral economics belongs to the mainstream is the match between the most prestigious scientific behavioral economists and the reputation in the mainstream of the universities that employ them, as is the case of Daniel Kahneman (Univ. of Princeton), Sendhil Mullainathan, and Richard Thaler (Univ. of Chicago), Robert Shiller (Yale Univ.), Matthew Rabin (Univ. of California Berkeley), George Akerlof (Georgetown Univ.) and Dan Ariely (Duke Univ.) century, both the Nobel Prize in Economics and the John Bates Clark Medal have been awarded to some of these researchers, such as Matthew Rabin (J.B. Clark 2001), Daniel Kahneman (Nobel 2002), Robert Shiller (Nobel 2013) and Richard Thaler (Nobel 2016) .

Considering neoclassical economics as the most influential representative of the mainstream and, at the same time, the direct intellectual rival of behavioral economics, some initial discussions are necessary to understand the advance of behavioral economics as a field of knowledge. On the one hand, neoclassical economics defined itself as anti-behavioral (Mullainathan & Thaler, 2000), conventionally assuming that each individual has stable and coherent preferences and that he rationally maximizes these preferences (Rabin, 1998). In contrast, behavioral economics has gained prominence by evidencing systematic violations that the world is not populated by calculating, unemotional maximizers. The contrast with neoclassical economics lies in the descriptive power of behavioral economics, which positions it as psychologically more “realistic” or “plausible” than neoclassical explanations of decision making (Angner & Loewenstein, 2012; Camerer, Loewenstein & Rabin, 2004) or the way it relaxes the standard assumptions of neoclassical (Mullainathan & Thaler, 2000).

For a long time, neoclassical and behavioral economists did not look each other in the eye, but nowadays, they often strive to minimize differences (Angner, 2019). Since behavioral economics has not strayed far from the idea that traditional economic methods and assumptions are adequate, nor has it abandoned all the correct insights from neoclassical economics (Rabin, 2002), it seems to have had some room to grow within the framework of the mainstream economics in recent decades. For Angner (2019), the maxim that Milton Friedman coined in the mid-1960s that "We are all Keynesians now" could be easily replaced in 2020 by: "We are all behavioral economists now." However, to what extent is there evidence to agree with this?

This work aims to analyze what, when and how behavioral economics has gained space in mainstream economics and, especially, what the space occupied by its discoveries in scientific publications. Geiger (2017) and Costa et al. (2019) showed that the intensity of behavioral economics participation had increased dramatically in mainstream economics journals and conferences, but more complete analyzes of how behavioral economics ideas have evolved to the point of gaining space are still scarce. How and where were they accepted? Which way did they go? How much and what do they represent in scientific production in economics? What topics have suffered/perished in the literature?

In order to establish an overview of the evolution of this research program within economics, this work analyses the presence of behavioral economics in leading international economics journals through bibliometrics. According to Vargas-Quesada and de Moya-Anegón (2007), bibliometric and scientometric approaches contribute to the domain analysis of a specific research field, which is precisely where this work on behavioral economics intends to advance. In general, it is possible to determine how (topics, areas, and articles), when (origins and evolution) the rise of behavioral economics towards the mainstream occurred, and who is responsible (authors, universities, journals, and countries). Additionally, the research seeks to establish an overview of publishing in behavioral economics, discussing its major contributions within the mainstream economics literature.

1.1 OBJECTIVES

This work aims to analyze how much interest in behavioral economics has increased over time and the space occupied by its discoveries in scientific publications of mainstream economics. More specifically, it aims to:

1) Investigate the field's presence in high-ranked economic journals, identifying those in which there is a greater intensity of publications.

2) Identify the most productive and relevant authors in terms of publication intensity and the number of citations, and their longevity of publication in the leading journals.

3) Establish a historical structure of the most important articles, as well as identify the most influential articles globally (outside the database) and locally (inside the database).

4) Analyze the geography of the publication, identifying the most productive countries and universities and their research collaboration network.

5) Evaluate the most representative topics, as well as the historical evolution of trends topics in publication.

2. LITERATURE REVIEW

This chapter includes a review of the literature on perspectives and definitions regarding mainstream economics and explores how behavioral economics developed as a subfield of economics.

2.1. ECONOMIC MAINSTREAM: DEFINITIONS AND PERSPECTIVES

To better understand behavioral economics in modern economics, it is necessary to understand the current stage, the clashes and terminology used to define the strands, and how economic science is hierarchical. Neoclassical orthodoxy is ordinarily considered the dominant or mainstream current of thought. However, a closer analysis of the history of economic thought, especially in its current stage, shows that these concepts are not so easily associated. Authors such as David Colander, Wade Hands, and Tony Lawson sought to understand the relationship between orthodoxy, mainstream economics, and neoclassicism to give them greater analytical precision.

In "The changing face of mainstream economics," Colander et al. (2004) use the term orthodox to represent a set of dominant ideas of immutable dimension relative to a specific period. Orthodoxy is an intellectual category, a static representation of a dynamic profession, and one that is never adequately descriptive of the field of economics in its current state. Specifying what is orthodox comes decades after it was supposed to exist. At the time, orthodoxy has no name.

On the other hand, the term mainstream relates to ideas endowed with reliability in the leading economic institutions, which may or may not be associated with orthodoxy. Economics is a dynamic entity, and static concepts are insufficient to characterize its change process. The change process is channeled through the relationship between the "economic elite" and creative and new economists, who slowly insert new points that widen the gap between orthodoxy and the mainstream.

Finally, the term neoclassical, first coined by Thorstein Veblen at the beginning of the 20th century, refers to the tradition of thought inaugurated by the marginalists and

Marshall[1], and is not representative of current economics. In the last decades, changes have slowly distanced economics from the neoclassical "Holy Trinity" (rationality, selfishness, and equilibrium), adopting a more eclectic position of intentional behavior, enlightened self-interest, and sustainability, although maintaining the method as its essence - which, for the author, is based on the mathematical modeling and formalization of discourse.

Aware of what has been happening in economics, Hands (2007) is concerned with knowledge about the impact of changes and how the contested terrain fits into the mainstream. For this, the author seeks to clarify the challenges of economics and how this science's theoretical core (rational choice) and object (allocation of scarce resources) have been responding to such changes. The focus is on the negative impact of empirical research on the core and the forces that make change with revolutionary potential.

Hands (2007) distinguishes economics, and normal science, through microeconomics manuals, which are fundamentally neoclassical. For him, the assumption of rationality is supposed to be the unity of economic thought. Moreover, this is precisely where behavioral economics comes in. The author understands that the behavioral economics approach poses severe problems for the rational choice approach. Research programs in economics are under pressure because experimental evidence (hyperbolic discounting, endowment effect, for example) contradicts the standard theory, and problems have spread to subfields of this science. However, some factors counterbalance and prevent these changes from having a revolutionary character. For example, the fact that economics is a consolidated science, with departments, awards, and political influence, means that economics has a lot to lose with changes in the balance within the subject. Therefore, the economy's future is open, and the potential for changes must be evaluated in terms of cost-benefits for the discipline.

Lawson (1997) approaches the current economics by pointing to its crisis and inability to explain social phenomena realistically. The failures of economics would not be at the level of substantive theorization but the level of methodology and social ontology (the nature of social reality). To reach this understanding, the author pays less attention to the concepts of orthodoxy and neoclassical economics, opposing the mainstream directly to heterodoxy. The difference between the latter two is better maintained in ontological terms than in substantive or political terms. The mainstream is based on deductivism or the search

[1] The suffix "neo" means a new form of classicism. Later, the term came to be used to designate the two syntheses operated in economics, the one that tied marginalist economics with classical economics and the one that linked Keynesian macroeconomics with neoclassical economics..

for laws regarding constant conjunctions of events or states of affairs. For this, its defenders are based on an ontology of closed systems composed of atomic objects in states of isolation, where only what can be experienced has relevance to scientific knowledge. These assumptions are implicit in almost all contemporary contributions, such as non-linear modeling, complexity modeling, simulation model, behavioral economics, or neuroeconomics.

In the case of heterodox schools, the difference between them cannot be sustained in ontological, substantive, or political terms but only in terms of the concern of each particular area with issues of interest. These currents are Marxist, post-Keynesian, Austrian, and institutionalist economics. In all these conceptions, whether as a function of method or as a result of a substantive mismatch between orthodoxy and the mainstream itself, it is undeniable that economic science has widened the spectrum of subjects considered intrinsically treatable initially by the neoclassical method and its instruments of analysis. In a sense, the expansion of the mainstream seems to be directly associated with the methodological pillars of rationality and balance, which loosen to fit the extensive scope. See the case of the new institutional economics and, particularly, behavioral economics.

3.2. BEHAVIORAL ECONOMICS AS A SUBFIELD OF ECONOMICS

Behavioral and neoclassical economists agree on the conception of economics as a science that studies people's decisions under conditions of scarcity and the results for society (Angner, 2019). However, the contrast is at the heart of behavioral economics, which seeks to be more psychologically "realistic" or "plausible" than standard economics (Angner & Loewenstein, 2012; Camerer & Loewenstein, 2004). The traditional economic framework neglected many advances from cognitive and social psychology (Mullainathan & Thaler, 2000), which established that individuals have stable and coherent preferences and rationally maximize their preferences (Rabin, 1998). For Angner (2019), while behavioral economists do not deny that people also act most of the time rationally, there is much evidence that they deviate from rationality intensely, systematically, and predictably to guarantee the development of a subfield of economics. From a pragmatic perspective, Chetty (2015) notes that behavioral economics represents more of a natural progression than a break with neoclassical economic methods. Nevertheless, Rabin (2002) also argues that

the behavioral economics research program is not an alternative but a natural continuation of the traditional economics research program.

The history of the classification system used by the American Economic Association (AEA) to classify the economic literature can be a relevant proxy for understanding the transformation of economics (Cherrier, 2017) and the very inclusion of subfields in the economic sciences. Altogether, there are three classification codes (JEL codes) assigned to behavioral economics: behavioral microeconomics (D9[current] or D03[pre-2017]), behavioral macroeconomics (E7[current] or E03[pre-2017]) and behavioral finance (G4[current] or G02[pre-2017]). When performing a basic search for articles tagged with these codes in RePEc's EconPapers database, the three codes had their first articles tagged in 2008, 2014, and 2012, respectively. This situation demonstrates an institutional recognition of behavioral economics as a subdiscipline, albeit recently.

Despite a still short history, behavioral economics has a more extended past. The emergence of the subdiscipline grew with the popularization of experimental methodology and the broadening of the scope of cognitive and social psychology to other social sciences. The fields of psychology, economics, and business developed more robust interfaces with the experimental method and laid solid foundations. In this scenario, several subdisciplines endorsed by major professional and academic associations have emerged, such as consumer psychology (Division 23 of the American Psychological Association), consumer behavior (Association for Consumer Research), and organizational behavior (Division of the Academy of Management). From a practical point of view, the American Economic Association was one of the last institutions to support this interface by implementing JEL codes for the subfield of behavioral economics starting in 2008.

Nowadays, it does not seem very easy to find an economics department in top universities that do not have behavioral economists as faculty members (Angner, 2019). As already mentioned, in the last 20 years, three prominent researchers in behavioral economics have been awarded the Nobel Prize in Economics (Daniel Kahneman [2002], Robert Shiller [2013], and Richard Thaler [2017]). In 2010, the Behavioral Insights Team emerged as a global initiative to apply findings from behavioral economics to inform policy and improve public services.

3. METHOD

Bibliometrics was chosen to identify how behavioral economics has established itself in mainstream economics in recent decades. According to Broadus (1987) and Martínez-López et al. (2018), bibliometrics is a research area of information and library sciences that studies bibliographic material using quantitative methods. According to Vargas-Quesada & de Moya-Anegón (2007), bibliometric studies are fundamental approaches that focus on domain analysis, and other approaches can be conceived as complementary and supportive.

The bibliometric method has been developing increasingly, and the works that use this technique are growing (Mokhtari et al., 2020). With the emergence of new technologies and the invention of bibliometric software packages, it is possible to have more efficient results with the bibliometric visualization of journals, including mapping their co-authorship, co-citation, co-occurrence of keywords and patterns, and bibliographic coupling networks. (Mokhtari et al., 2020). Furthermore, bibliometrics is widely used to summarize the most representative results from bibliographic documents (Martínez-López et al., 2018). This work investigates the penetration of behavioral economics research in mainstream economics journals through bibliometrics. R software and RStudio were used to run the bibliometric analyses through the "bibliometrix" package and the "biblioshiny" web interface.

3.1. BIBLIOMETRIC PROCEDURES

3.1.1. Database and sources

The analysis used the Web of Science database - Social Sciences Citation Index (SSCI), where a search was carried out in the 30 best-ranked journals in economics. SSCI contains all 30 journals that occupy the best positions in economic journals, according to Ham et al. (2021). We chose 30 journals for two reasons: 1) there is little variability in which journals are part of this group; 2) the best economics schools in the world tend to consider between 20 and 30 journals for faculty tenure-tracking. Undoubtedly, the premier or "top tier" journals in economics are always the big five: Quarterly Journal of Economics (QJE), American Economic Review (AER), Econometrica (ECON), Review of Economics Studies (RES), and Journal of Political Economy (JPE). The second group, which contains journals considered the "first tier," varies between rankings and universities but usually includes

more than two dozen journals with a high impact factor. Table 1 shows the 30 journals included in the search.

3.1.2. Search terms

Fifty-six generic and specific terms from behavioral economics were chosen from the behavioral economics glossary published by behavioraleconomics.com. This website is signed by professor Alain Samson annually and publishes a Guide to Behavioral Economics, including theoretical advances, applications, and reflections on the scientific field. The glossary has 98 terms, but as it contains terms not used exclusively in behavioral economics (for example, honesty and incentives), two independent judges with a minimum master's degree and experience in behavioral economics research were asked to conduct an assessment. The judges were asked to select the terms that, with a high degree of certainty, are used exclusively by research in behavioral economics. The judges agreed in 93% of the cases, disagreeing on whether or not to include 7 terms. The judges were then encouraged to debate these terms and reached a consensus of 56 inclusions. The present work differs drastically from other bibliometric efforts, such as those by Geiger (2017) and Costa et al. (2019), who have only searched for generic terms such as "behavioral economics" and "behavioral finance." The strategy of these authors ended up limiting the analysis to articles tagged by authors or databases with the field's name, and that is not always the case. The 56 terms selected were the following: "action bias", "affect heuristic", "anchoring", "availability heuristic", "behavioral finance", "behavioral economics", "bounded rationality", "choice architecture", "choice overload", "cognitive bias", "cognitive dissonance", "confirmation bias", "control premium", "decision fatigue", "decoy effect", "default option", "disposition effect", "diversification bias", "dual-self model", "dual-system theory", "ego depletion", " empathy gap", "endowment effect", "framing effect", "gambler’s fallacy", "halo effect", "hedonic adaptation", "herd behavior", "heuristic", "hindsight bias", "homo economicus", "ikea effect", "inequity aversion", "information avoidance", "intertemporal choice", "loss aversion", "mental accounting", "nudge", "optimism bias", "overconfidence", "overjustification", "preference reversal", "present bias", "priming", "procrastination", "projection bias", "prospect theory", "ratio bias", "recognition heuristic", "regret aversion", "regulatory focus theory", "representativeness heuristic", "self-control", "status quo bias", "sunk cost fallacy", "zero price effect".

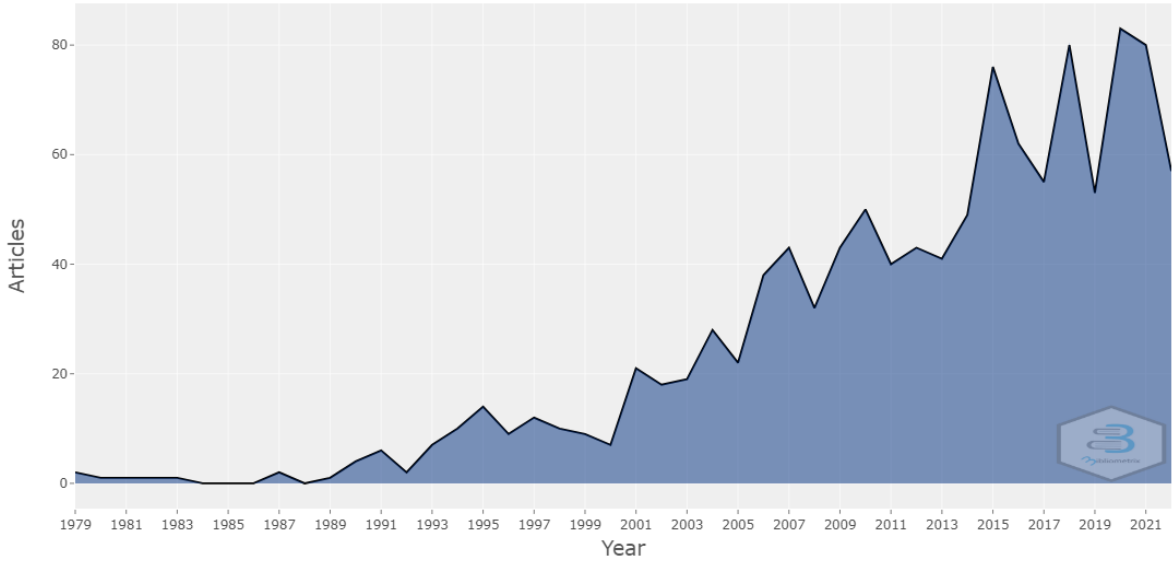
3.1.3. Searching procedures and initial data treatment

We used the advanced search engine on the Web of Science platform, restricting to the top 30 ranked economic journals presented in table 1 and the 56 terms presented previously. Thus, only two fields were used to search the Web of Science: 1) "Publication titles," which searches for titles of journals, books, and annals; 2) "Topic," which searches the title, abstract, the author's keywords and Keywords Plus (Web of Science). In both cases, Boolean search operators "OR" were used. The search returned 1147 documents extracted from the platform in plain text (txt) format. As an export limit of 500 records per download on the platform, 3 different files were extracted and merged.

4. RESULTS

The search returned 1,147 articles and reached 29 of the 30 top-ranked journals, the only exception being the Journal of Economic Growth, which did not return any results. The number of authors who published on topics related to behavioral economics is 1792. The average age of the articles returned is close to 10 years (9.86 years), with an average annual growth of 8.97%, which indicates that the literature is young and growing. Figure 1 shows the evolution of the number of articles on behavioral economics published in mainstream economic journals.

Figure 1 – Articles published by year



Source: Research data (2022).

4.1. JOURNALS

As a highlight, the five top-tier journals (QJE, AER, ECON, RES and JPE) published 425 articles in behavioral economics, which corresponds to 37% of the total sample, with the American Economic Review being the journal with the highest penetration of articles in the area, corresponding to 172 articles, about 15% of the total. Table 1 presents the 30 selected mainstream journals, ranked by the highest volume of published articles on behavioral economics.

Table 1 – Journal ranking by published articles in behavioral economics

RANK	JOURNAL	ARTICLES
1	AMERICAN ECONOMIC REVIEW*	172
2	JOURNAL OF ECONOMIC THEORY	134
3	EXPERIMENTAL ECONOMICS	98
4	ECONOMETRICA*	86
5	ECONOMIC JOURNAL	73
6	JOURNAL OF PUBLIC ECONOMICS	71
7	QUARTERLY JOURNAL OF ECONOMICS*	67
8	REVIEW OF ECONOMIC STUDIES*	59
9	JOURNAL OF THE EUROPEAN ECONOMIC ASSOCIATION	50
10	AMERICAN ECONOMIC JOURNAL-MICROECONOMICS	44
11	JOURNAL OF POLITICAL ECONOMY*	41
12	THEORETICAL ECONOMICS	33
13	REVIEW OF ECONOMICS AND STATISTICS	30
14	JOURNAL OF DEVELOPMENT ECONOMICS	29
15	INTERNATIONAL ECONOMIC REVIEW	24
16	JOURNAL OF MONETARY ECONOMICS	23
17	AMERICAN ECONOMIC JOURNAL-ECONOMIC POLICY	19
18	RAND JOURNAL OF ECONOMICS	16
19	AMERICAN ECONOMIC JOURNAL-APPLIED ECONOMICS	12
20	JOURNAL OF ECONOMETRICS	9
21	JOURNAL OF INTERNATIONAL ECONOMICS	9
22	QUANTITATIVE ECONOMICS	9
23	JOURNAL OF APPLIED ECONOMETRICS	7
24	REVIEW OF ECONOMIC DYNAMICS	7
25	JOURNAL OF HUMAN RESOURCES	6
26	JOURNAL OF LABOR ECONOMICS	6
27	AMERICAN ECONOMIC JOURNAL-MACROECONOMICS	5
28	ECONOMETRIC THEORY	4
29	JOURNAL OF BUSINESS & ECONOMIC STATISTICS	4
30	JOURNAL OF ECONOMIC GROWTH	0

*Premier journals (top tier)
Source: Research data (2022).

An analysis of the references in the database (29,045 references)shows a predominance of citations of articles published in premier journals (13,592 references), concentrating 46.8% of the total references, as seen in table 2.

Table 2 – Most cited publications on database

RANK	JOURNAL	ARTICLES
1	AMERICAN ECONOMIC REVIEW*	4673
2	ECONOMETRICA*	3083
3	QUARTERLY JOURNAL OF ECONMICS*	2999
4	JOURNAL OF POLITICAL ECONOMY*	1482
5	REVIEW OF ECONOMIC STUDIES*	1355
6	JOURNAL OF ECONOMIC THEORY	1183
7	JOURNAL OF FINANCE	834
8	JOURNAL OF ECONOMIC BEHAVIOR AND ORGANIZATION	814
9	GAME ECONOMIC BEHAVIOR	775
10	JOURNAL OF RISK UNCERTAINTY	730

**Premier journals (top tier)*
Source: Research data (2022).

In order to cluster the most important sources, Bradford's Law was used, which ranks decreasingly the productivity of articles on a given subject in scientific journals through exponentially divided groupings. The final product is three zones of relevance, where the American Economic Review, Journal of Economic Theory, and Experimental Economics stand out as the most significant, with a cumulative frequency of 404 articles..

Table 3 – Clustering of journals by productivity zones

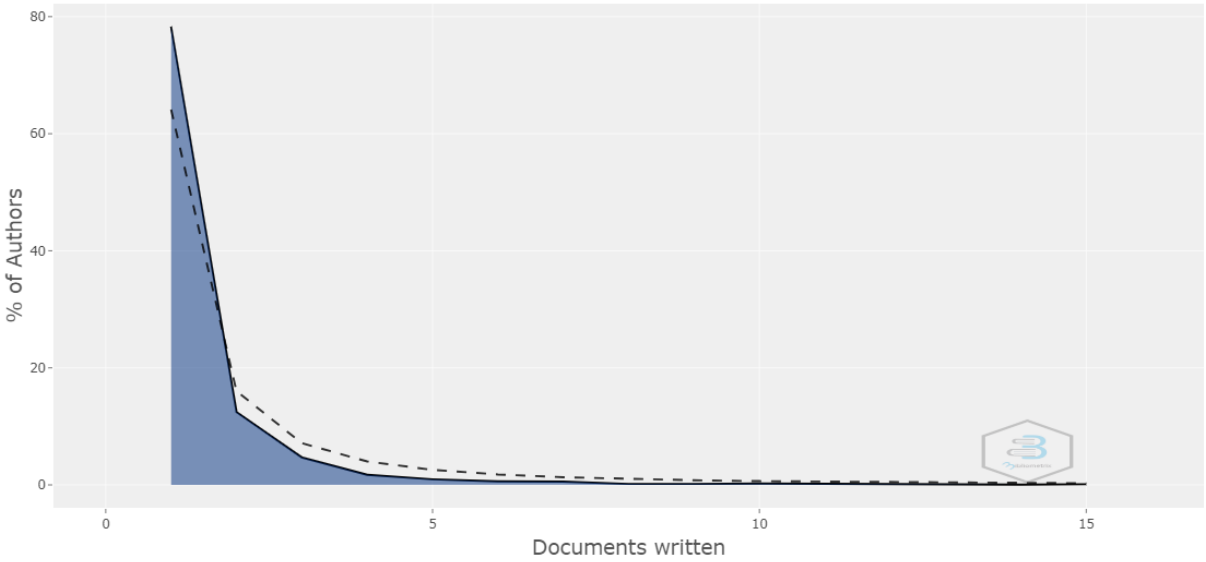
RANK	JOURNAL	FREQ	CUM FREQ	Zone
1	AMERICAN ECONOMIC REVIEW	172	172	Zone 1
2	JOURNAL OF ECONOMIC THEORY	134	306	Zone 1
3	EXPERIMENTAL ECONOMICS	98	404	Zone 1
4	ECONOMETRICA	86	490	Zone 2
5	ECONOMIC JOURNAL	73	563	Zone 2
6	JOURNAL OF PUBLIC ECONOMICS	71	634	Zone 2
7	QUARTERLY JOURNAL OF ECONOMICS	67	701	Zone 2
8	REVIEW OF ECONOMIC STUDIES	59	760	Zone 2
9	JOURNAL OF THE EUROPEAN ECONOMIC ASSOC	50	810	Zone 2
	OTHERS			Zone 3

Source: Research data (2022).

4.2. AUTHORS

The publication frequency distribution of authors in behavioral economics follows Lotka's Law, reproducing the inverse square law and Pareto's principle (figure 2), in which the number of authors who publish a certain number of articles is a fixed proportion for the number of authors who publish a single article. In the sample, more than 90% of 1,792 authors who published in behavioral economics did not publish more than two articles, and more than 95% of the authors did not publish more than three articles. The actual distribution of the sample is similar to the theoretical distribution expected by Lotka's Law (dotted line in figure 2), indicating an analytical consistency of bibliometrics. As expected by Lotka's law, behavioral economics in mainstream journals has two very particular groups, the core authors (seven articles or more), representing 1.6% of the authors, and the occasional authors (only one article), representing 78.29% of the authors (table 4).

Figure 2 – Frequency distribution of articles published by author (Lotka's Law)



Source: Research data (2022).

Table 4 – Frequency distribution of articles published by author (Lotka's Law)

DOCUMENTS WRITTEN	N. OF AUTHORS	PROPORTION OF AUTHORS
1	1403	78,29%
2	223	12,44%
3	84	4,69%
4	31	1,72%
5	17	0,94%
6	11	0,61%
7	10	0,55%
8	3	0,33%
9	3	0,33%
10	4	0,22%
14	1	0,06%
15	2	0,11%

Source: Research data (2022).

Among the 20 most productive authors, it is possible to identify many with well-known international recognition and winners of international awards and honors in economic sciences. Table 5 presents the most productive authors, their affiliations, awards, and the presence of articles on behavioral economics in the leading economics journals.

Most of the authors shown in table 5 have or had great productive longevity (figure 3), and many continue to publish in the top 30 economic journals. One of the exceptions is Daniel Kahneman, who had his last major publication in 2005, and has recently been dedicated to the scientific popularization of behavioral economics, increasing his participation in non-scientific events and publishing books such as “Fast and Slow” and “Noise.” As can be seen in figure 3, five authors are among those with greater longevity (25 years or more) in their set of publications in the leading journals. Two are the winners of

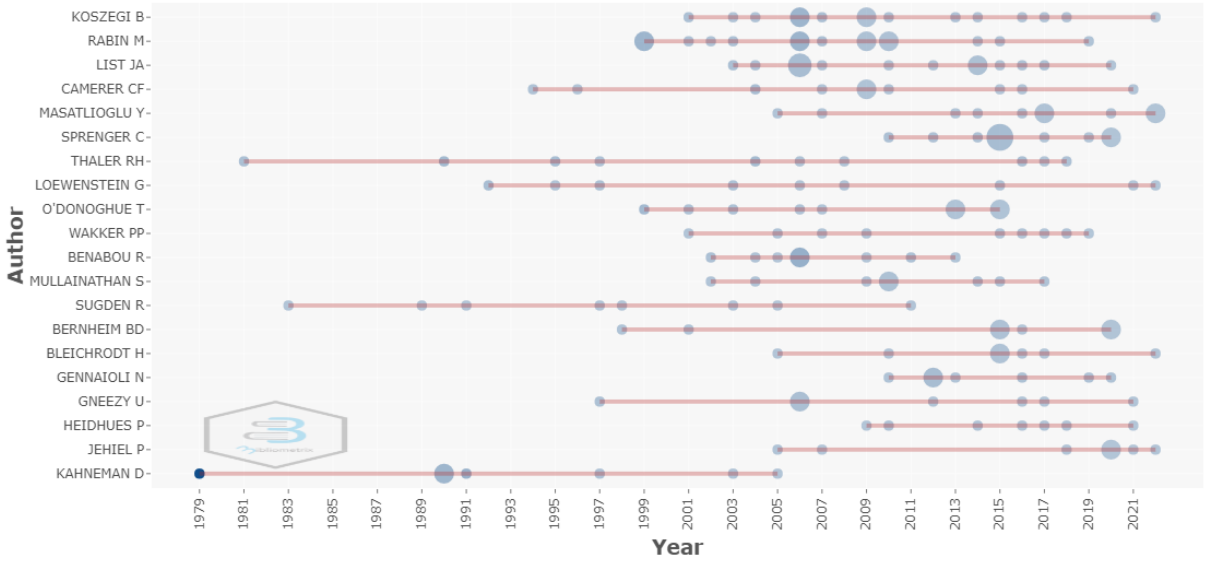
the Nobel Prize in economics, Richard Thaler (36 years) and Daniel Kahneman (26 years). The other three authors are George Loewenstein (30 years), Robert Sugden (28 years), and Colin Camerer (27 years).

Table 5 – Most productive authors

AUTHOR	AFFILIATION	AWARDS	ARTICLES	ART FRACTIONALIZED
B Koszegi	Central European	Yrjö Jahnsson Award	15	7.50
M Rabin	Harvard	John Bates Clark Medal	15	7.83
JA List	Chicago	Klein Prize	14	7.17
CF Camerer	Caltech		10	4.42
Y Masatlioglu	Mariland		10	4.17
C Sprenger	Caltech		10	5.00
RH Thaler	Chicago	Nobel Prize	10	5.67
G Loewenstein	Carnegie Mellon		9	3.75
T O'donoghue	Cornell		9	4.17
PP Wakker	Erasmus		9	3.78
R Benabou	Princeton	Jean-Jacques Laffont Prize	8	4.33
S Mullainathan	Chicago	Infosys Prize	8	3.20
R Sugden	East Anglia	Joseph B Gittler Award	8	3.23
BD Bernheim	Stanford		7	2.53
H Bleichrodt	Erasmus		7	2.78
N Gennaioli	Bocconi		7	2.33
U Gneezy	California SD		7	2.92
P Heidhues	Düsseldorf		7	3.17
P Jehiel	Paris		7	4.00
D Kahneman	Princeton	Nobel prize	7	3.12

Source: Research data (2022).

Figure 3 – Production by leading authors over the years



Source: Research data (2022).

When analyzing the most influential authors (highest number of local citations) within the selected sample (table 6), six have more than 200 citations in the database references, and

six stand out with at least 200 citations. Again, the two Nobel Prize winners in economics, Daniel Kahneman and Richard Thaler, are part of this group, along with Matthew Rabin, Amos Tversky, Botond Koszegi, and Ted O'Donoghue.

Table 6 – Local citations by author in the database

AUTHOR	LOCAL CITATIONS
M Rabin	530
D Kahneman	429
A Tversky	393
B Koszegi	351
T O'donoghue	254
RH Thaler	234
R Benabou	152
F Gul	146
J Tirole	144
W Pesendorfer	139
S Dellavigna	127
U Malmendier	121
G Loewenstein	120
C Sprenger	118
JA List	110
C Camerer	91
D Fudenberg	89
DK Levine	84
S Mullainathan	84
S Benartzi	82

Source: Research data (2022).

4.3. DOCUMENTS AND REFERENCES

Among the behavioral economics articles in the sample and considering only the Web of Science database, the document with the most remarkable scientific influence is "Prospect theory: an analysis of decision under risk" by Daniel Kahneman and Amos Tversky, published in 1979 in Econometrica. Nevertheless, this is the most cited article in the field of economics on the Web of Science, accumulating approximately 26,000 citations, equivalent to approximately 600 citations per year. Other articles in table 7 also have an expressive number of citations, but none close to the article in the "Prospect theory."

Table 8 shows the behavioral economics articles in the sample with the strongest influence within the sample. Again, the article in the "Prospect theory" by Kahneman and Tversky (1979) is the most influential, with 260 citations. Matthew Rabin is another prominent author on this list, co-authoring the second and third most influential articles, which complete the list of works with at least 100 local citations. Co-authored with Ted O'Donoghue, the article "Doing it now or later" on self-control problems that lead to

procrastination, published in 1999 in the American Economic Review, ranks second with 123 citations. Third, with 106 citations, is the work by Rabin, co-authored with Botond Koszegi, entitled "A Model of reference-dependent preferences," which develops a model of loss aversion from reference points of the economic environment, published in 2006 in the Quarterly Journal of Economics.

Tables 7 and 8 show the 20 articles in the sample with the highest number of global (Web of Science) and local (sample) citations, respectively. In both, one can observe the presence of the most productive and relevant authors, according to previous analyses. Figure 4 shows the spectroscopy of 80 years (1942-2022) of the analyzed literature, using the annual horizon of publications as a reference. This analysis identifies peaks that include remarkable events for the field based on the number of references cited in a given year and the deviation from the median of 5 years. The most important peak is concentrated again around the publication of the "Prospect theory" in Econometrica, which took place in 1979.

Figure 5 analyzes the historical structure of direct citations, identifying the historical path of different lines of research. This analysis shows the historical role of the work of the Nobel Prize winners Daniel Kahneman and Richard Thaler. While Daniel Kahneman and Amos Tversky's work first established the research on judgment and decision-making under uncertainty, Richard Thaler and Hersh Shefrin incorporated psychological elements (in this case, self-control in intertemporal choice) in economic theory for the first time, in this case.

Table 7 – Articles with the highest global citations

DOCUMENT	JOURNAL	TITLE	TOTAL CITATIONS	TC / YEAR
KAHNEMAN; TVERSKY (1979)	ECON	Prospect Theory: An Analysis of Decision under Risk	25889	588.4
TVERSKY; KAHNEMAN (1991)	QJE	Loss Aversion in Riskless Choice	3053	95.4
BANERJEE (1992)	QJE	A Simple Model of Herd Behavior	2546	82.1
KAHNEMAN; KNETSCH; THALER (1990)	JPE	Experimental Tests of the Endowment Effect and the Coase Theorem	1941	58.8
BARBER; ODEAN (2001)	QJE	Boys will be Boys: Gender, Overconfidence, and Common Stock Investment	1803	81.9
O'DONOGHUE; RABIN (1999)	AER	Doing it Now or Later	1374	57.2
SCHARFSTEIN (1990)	AER	Herd Behavior and Investment	1348	40.8
BENABOU; TIROLE (2006)	AER	Incentives and Prosocial Behavior	1328	78.1
HENRICH et al. (2001)	AER	In Search of Homo Economicus: Behavioral Experiments in 15 Small-Scale Societies	1227	55.7
KOSZEGI; RABIN (2006)	QJE	A Model of Reference-Dependent Preferences	1168	68.7
BENARTZI; THALER (1995)	QJE	Myopic Loss Aversion and the Equity Premium Puzzle	1097	39.1
KANDORI; MAILATH; ROB (1993)	ECON	Learning, Mutation, and Long Run Equilibria in Games	1071	35.7
THALER; SHEFRIN (1981)	JPE	An Economic Theory of Self-Control	1063	25.3
LOEWENSTEIN; PRELEC (1992)	QJE	Anomalies in Intertemporal Choice: Evidence and an Interpretation	1045	33.7
BARSKY et al. (1997)	QJE	Preference Parameters and Behavioral Heterogeneity: An Experimental Approach in the Health and Retirement Study	971	37.3
PRELEC (1998)	ECON	The Probability Weighting Function	954	38.1
CAMERER; LOVALLO (1999)	AER	Overconfidence and Excess Entry: An Experimental Approach	953	39.7
THALER; BENARTZI (2004)	JPE	Save More Tomorrow: Using Behavioral Economics to Increase Employee Saving	945	49.7
HORTON; RAND; ZECKHAUSER (2011)	EE	The Online Laboratory: conducting experiments in a real labor market	819	68.2
SCHEINKMAN; XIONG (2003)	JPE	Overconfidence and Speculative Bubbles	805	40.2

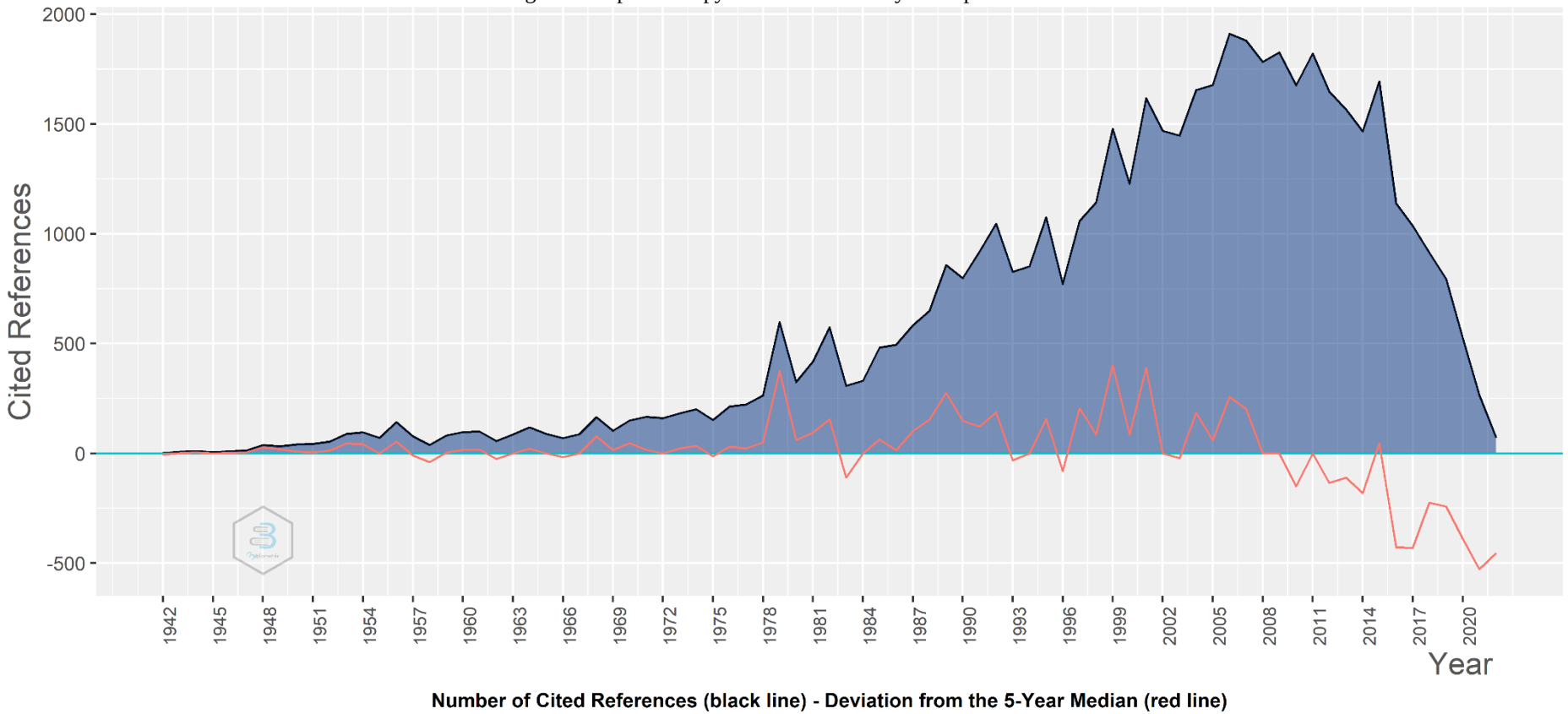
Source: Research data (2022).

Table 8 – Articles with the highest local citations

DOCUMENT	JOURNAL	TITLE	LOCAL CITATIONS	GLOBAL CITATIONS	LC/GC RATIO
KAHNEMAN; TVERSKY (1979)	ECON	Prospect Theory: An Analysis of Decision under Risk	260	25889	1.00
O'DONOGHUE; RABIN (1999)	AER	Doing it Now or Later	123	1374	8.95
KOSZEGI; RABIN (2006)	QJE	A Model of Reference-Dependent Preferences	107	1168	9.16
GUL; PESENDORFER (2001)	ECON	Temptation and Self-Control	97	513	18.91
TVERSKY; KAHNEMAN (1991)	QJE	Loss Aversion in Riskless Choice	77	3053	2.52
FUDENBERG; LEVINE (2006)	AER	A Dual-Self Model of Impulse Control	64	423	15.13
DELLAVIGNA; MALMENDIER (2004)	QJE	Contract Design and Self-Control: Theory and Evidence	59	317	18.61
BANERJEE (1992)	QJE	A Simple Model of Herd Behavior	58	2546	2.28
BENABOU; TIROLE (2002)	QJE	Self-Confidence and Personal Motivation	57	518	11.00
DELLAVIGNA; MALMENDIER (2006)	AER	Paying Not to Go to the Gym	53	451	11.75
KAHNEMAN; KNETSCH; THALER (1990)	JPE	Experimental Tests of the Endowment Effect and the Coase Theorem	51	1941	2.63
KOSZEGI; RABIN (2007)	AER	Reference-Dependent Risk Attitudes	51	415	12.29
BENARTZI; THALER (1995)	QJE	Myopic Loss Aversion and the Equity Premium Puzzle	48	1097	4.38
THALER; SHEFRIN (1981)	JPE	An Economic Theory of Self-Control	46	1063	4.33
O'DONOGHUE; RABIN (2001)	QJE	Choice and Procrastination	45	359	12.53
AUGENBLICK; NIEDERLE; SPRENGLER (2015)	QJE	Working over Time: Dynamic Inconsistency in Real Effort Tasks	45	148	30.41
PRELEC (1998)	ECON	The Probability Weighting Function	44	954	4.61
GENESOVE; MAYER (2001)	QJE	Loss Aversion and Seller Behavior: Evidence from the Housing Market	40	651	6.14
CAMERER et al. (1997)	QJE	Labor Supply of New York City Cabdrivers: One Day at a Time	38	510	7.45
CAMERER; LOVALLO (1999)	AER	Overconfidence and Excess Entry: An Experimental Approach	38	953	3.99

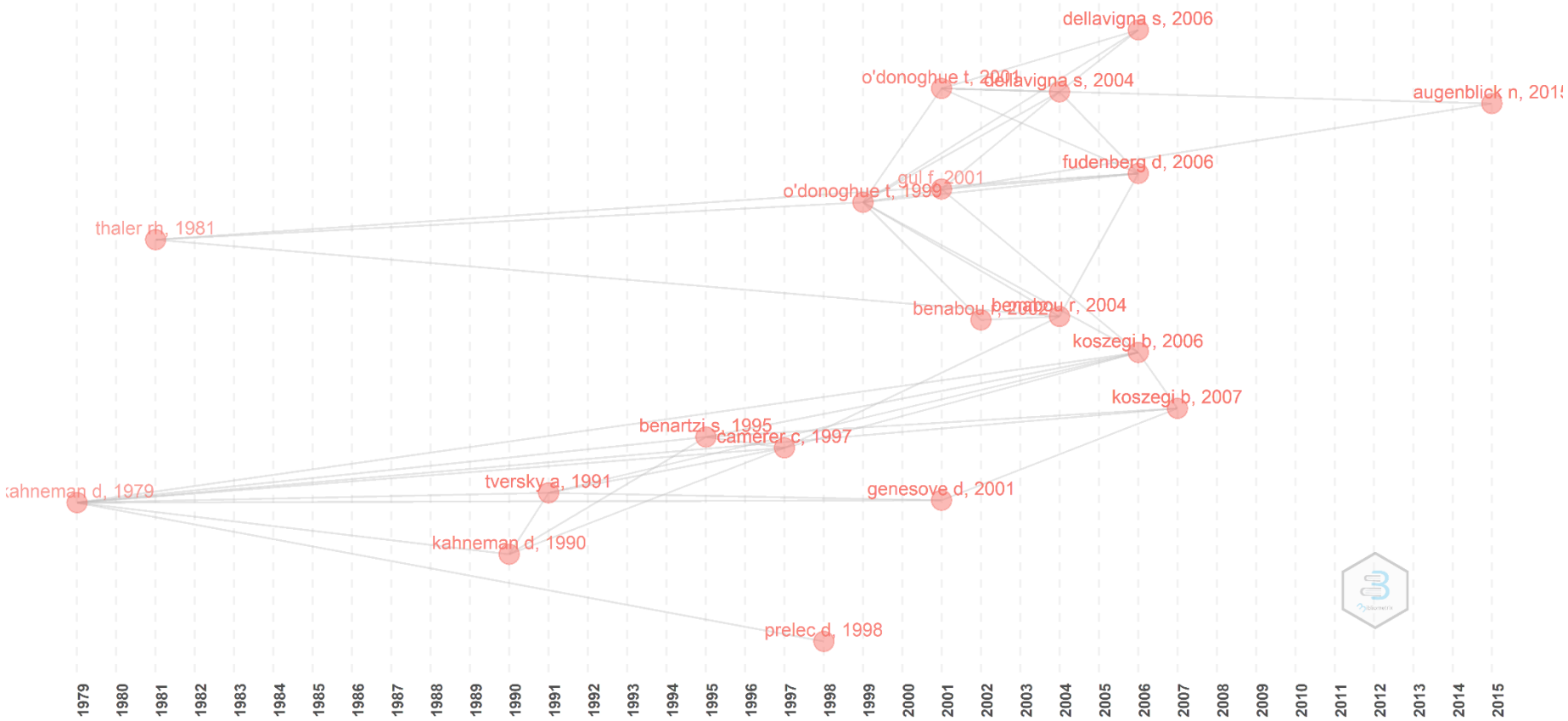
Source: Research data (2022).

Figure 4 – Spectroscopy of the reference's year of publication



Source: Research data (2022).

Figure 5 – Historical structure of the citation network



Source: Research data (2022).

4.4. COUNTRIES AND AFFILIATIONS

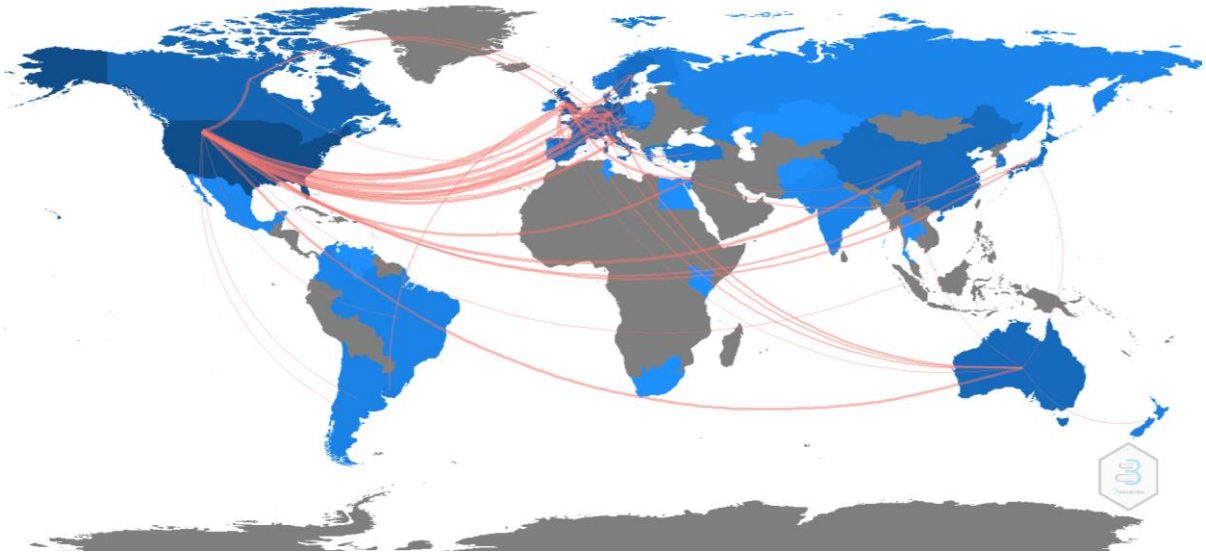
When analyzing the country of origin of the corresponding author and co-authors, a significant dominance of the USA is observed (table 9), with more than half of the leading scientific publications in behavioral economics. Other countries such as the United Kingdom (10.93%) and Germany (4.94%) also have a prominent position, although very far from the leadership. Figure 6 analyzes the collaboration network between countries for the articles in the database. The ratio between inter-country and intra-country collaboration presented in table 9 shows that collaboration between countries is more intense for authors who do not come from the USA. Figures 6 and 7 illustrate the high intensity of the flow of research collaborations between US authors and authors from other countries.

Table 9 – Author's country of origin

COUNTRY	CORR AUTHORS	CO-AUTHORS	PCT	SCP	MCP	MCP_RATIO
USA	628	1408	55,38%	500	128	20,4%
United Kingdom	124	264	10,93%	49	75	60,5%
Germany	56	184	4,94%	26	30	53,6%
Netherlands	41	102	3,62%	16	25	61,0%
Canada	37	74	3,26%	19	18	48,6%
Switzerland	32	67	2,82%	14	18	56,2%
France	26	79	2,29%	12	14	53,8%
Australia	23	53	2,03%	6	17	73,9%
Italy	22	64	1,94%	7	15	68,2%
China	20	55	1,76%	7	13	65,0%

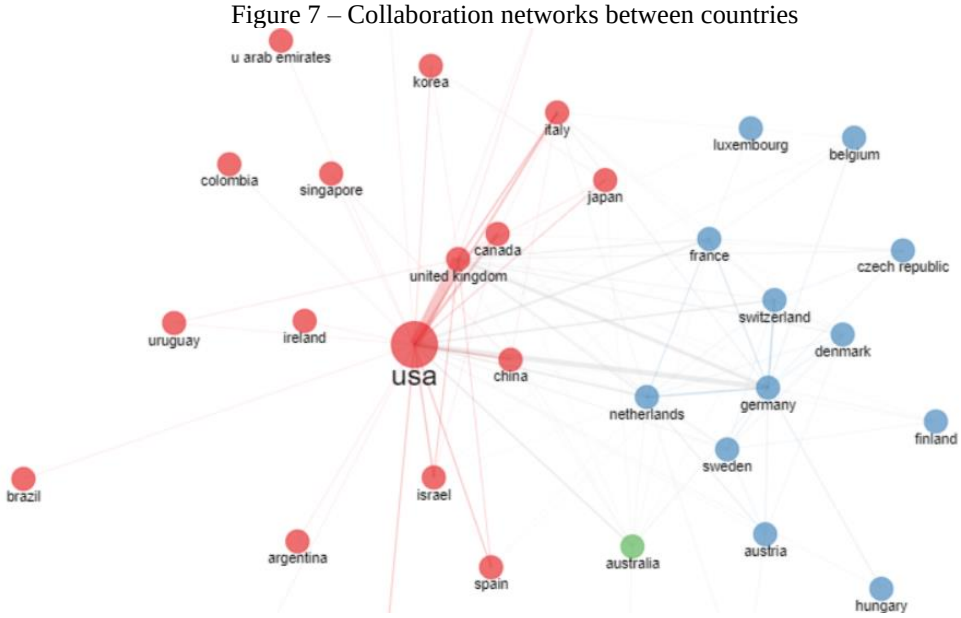
SCP: Intra-country collaboration
MCP: Inter-country collaboration
Source: Research data (2022).

Figure 6 – Map of collaboration between countries



Source: Research data (2022).

Figure 7 – Collaboration networks between countries



Source: Research data (2022).

At the authors' affiliation level, considering the universities with the highest production in the database, fourteen are from the USA. Notably, the top three universities with the highest publication in behavioral economics are Harvard, Berkeley, and Chicago, which are also top-ranked in the US economics school rankings (McPherson, 2012). Table 10 shows that the non-American universities that appear in the ranking – Zurich, LSE, Erasmus, Tilburg, and Toronto – are among the 50 best schools of economics in the world (IDEAS/Repec, 2022). When analyzing collaboration networks between institutions (figure 8), Harvard, Berkeley, and Chicago, in addition to the National Bureau of Economic Research (USA), have a greater intensity of collaboration with other institutions.

Table 10 – Articles published by author's affiliations

AFFILIATIONS	ARTICLES	USA RANK (2012)	WORLD RANK (2022)
Harvard Univ	74	1	1
Univ Calif Berkeley	72	3	3
Univ Chicago	57	2	4
Princeton Univ	48	12	6
Stanford Univ	44	5	7
Columbia Univ	40	9	9
Natl Bur Econ Res	40	-	-
Yale Univ	40	10	12
Univ Penn	38	8	15
Univ Calif San Diego	37	18	18
Northwestern Univ	31	7	19
Cornell Univ	29	15	36
Univ Zurich	29	-	37
London Sch Econ	25	-	22
Univ Michigan	23	11	24
Erasmus Univ	22	-	50
Tilburg Univ	21		28
Univ Maryland	21	16	43
Carnegie Mellon Univ	19	26	115
Univ Toronto	19		34

Source: Research data (2022).

Figure 8 – Collaboration between institutions

Source: Research data (2022).

4.5. THEMES AND KEYWORDS

For the main topics of behavioral economics published in the leading economics journals, two word clouds were created, one from Keywords Plus (generated by WoS) (figure 9) and the other from the authors' keywords (figure 10). Keywords Plus are index terms automatically generated by a Web of Science algorithm from the titles of cited articles. They must appear more than once in the bibliography and are ordered from multi-word phrases to single terms. There is an intense similarity between the clouds, with "prospect theory" and "self-control" highlighted in both. These themes were decisive in the evolution of behavioral economics from the work of Kahneman and Tversky (1979) and Thaler and Sheffrin (1981), as previously spotlighted.

Figure 9 – Word cloud (Keywords Plus)

Source: Research data (2022).

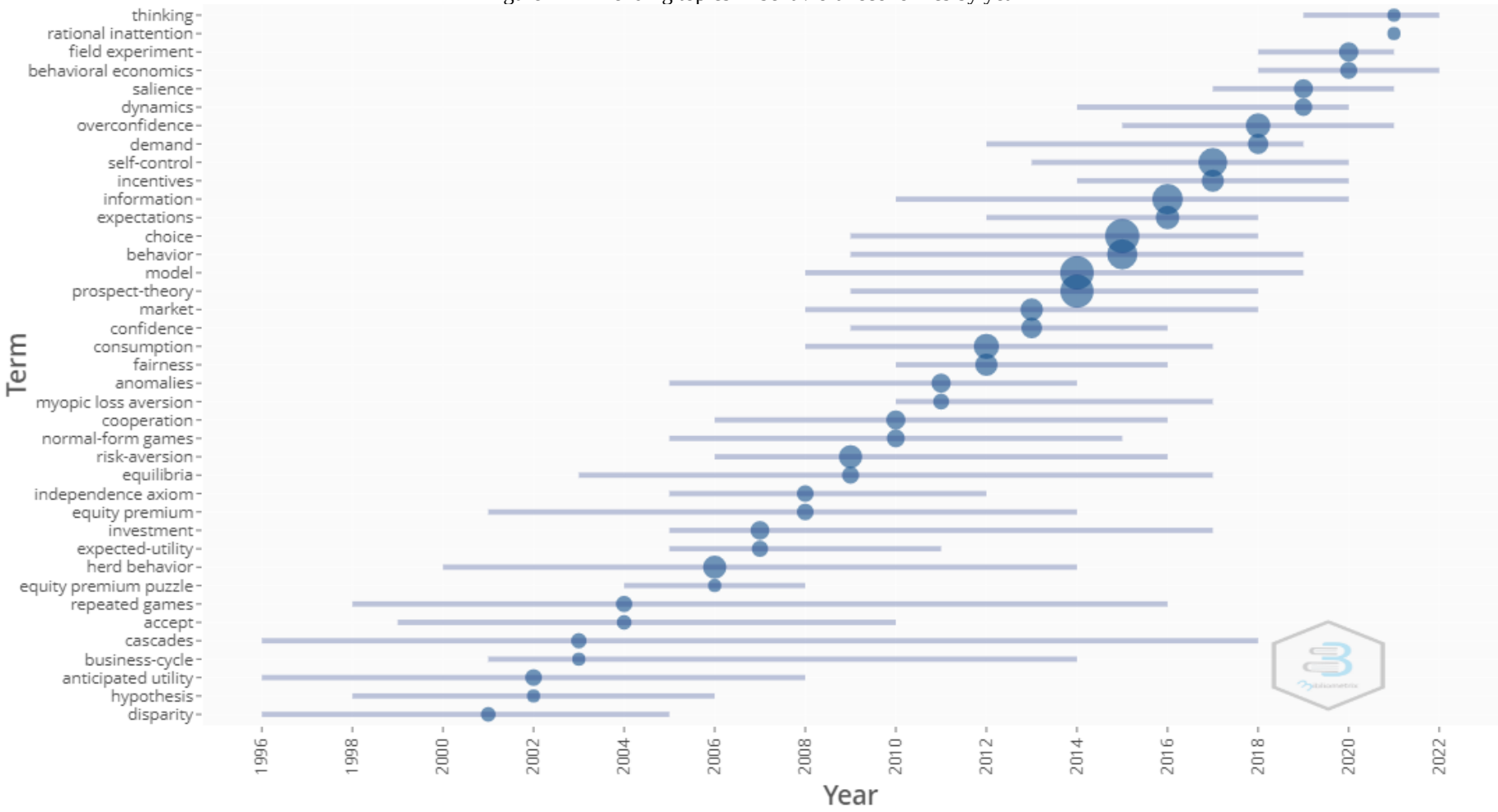
Figure 10 – Word cloud (authors' keywords)

Source: Research data (2022).

Figure 11 shows the trend topics on behavioral economics in the leading journals over time, covering the entire range of publications in the sample (1979-2022). The analysis considers the two Keywords Plus with the highest frequency (figure 11) with a minimum of five annual appearances, which narrowed the time interval from 1996 to 2021. This narrowing is related to the periods of dissemination (the 1990s) and the popularization (the 2000s) of behavioral economics.

As current trends in behavioral economics publications, the terms "rational inattention" and "thinking" (2021) and "behavioral economics" and "field experiments" (2020) stand out. Among these topics, we spotlight the term rational inattention, which has received great repercussion in recent years, with a presence in top economic journals such as the QJE and AER, in addition to works published in the primary scientific communication journals Nature (Gershman & Bhui, 2020). and Science (Grujic et al., 2022). Many fields have been encouraging field experiments in areas that use experiments in social sciences towards external validity and generalization of knowledge, in addition to a criticism of the artificiality of laboratory experiments. In 2020, Nobel Prize winners in economics Ester Duflo and Abhijit Banerjee had their speeches edited and published in the American Economic Review, where they advocated the importance of field experiments for the practice of economics (Banerjee, 2020) and public policy (Duflo, 2020).

Figure 11 – Trending topics in behavioral economics by year



Source: Research data (2022).

5. FINAL DISCUSSIONS

The present bibliometric study allows us to conclude that behavioral economics has a high penetration in the leading economic journals, occupying a relevant space in the mainstream. More than a thousand articles were published in 29 of the 30 analyzed journals. The literature is young, with an average age of approximately 10 years, and is still growing within these journals, around 9% per year. In general, the five top-tier journals are pretty open to publishing articles on behavioral economics, corresponding to 37% of the total number of articles in the database. The American Economic Review has a leading position, absorbing 15% of all articles in the sample. The growth of behavioral economics in mainstream economics publications accelerated after the mid-1990s and early 2000s. This acceptance may result from a research program Rabin (2002) calls a natural continuation of the traditional economics research program.

The number of authors who have already published topics on behavioral economics in the leading journals is quite expressive, reaching close to 1800. However, almost 80% of these authors occasionally publish only one article. The actual distribution of authors followed the distribution expected by Lotka's Law, evidencing a high degree of reliability in the bibliometric procedures employed. Among the leading authors, who have seven or more publications, and those with at least 100 citations in the sample, it is possible to identify distinguished names in the field with notable recognition of awards and honors in economic sciences.

Analyzing local and global citations and their historical structure allowed us to identify the importance of the work of Nobel Prize winners in economics Daniel Kahneman and Richard Thaler. The "prospect theory" by Daniel Kahneman, together with Amos Tversky, leads the field in all aspects of frequency (local and global citations) and importance of publication (peak of interest, influence in other works). This work has established the research on judgment and decision-making under uncertainty. The work on "self-control" by Richard Thaler and Hersh Shefrin had fundamental importance for implementing psychological elements in the research program in economics, influencing many other works.

The USA is the primary scientific power of behavioral economics in the leading journals, and its prestigious mainstream economic schools – the University of Harvard, University of California Berkeley, and the University of Chicago – are those that exert the most presence of publications and greater intensity of collaboration with other countries and institutions. The publication of articles on behavioral economics is highly concentrated on

authors affiliated with the best schools of economics in the world and those that determine the direction of economic sciences. To be part of the mainstream, Colander et al. (2004) advocate that ideas need to be endowed with reliability in the central economic institutions, which seems to be the case of behavioral economics and its growing acceptance by the great scientific powers (universities, associations, publications). Collaboration between countries and between universities reinforces the protagonism of the great institutional powers in the scientific configuration of behavioral economics in the mainstream.

Concerning the most prominent themes in behavioral economics, the "prospect theory" and "self-control" are the terms that appear more frequently in the keywords in behavioral economics, reinforcing the importance of the seminal works of Kahneman and Tversky (1979) and Thaler and Sheffrin (1981) again. The work allowed us to identify current trends in behavioral economics. Rational inattention (theory) and field experiments (method) stand out as recent advances in the field. Rational inattention has received the attention of the most reputable scientific journals, Nature and Science. Field experiments have resonated from the recent speeches of the 2020 Nobel Prize winners in Economics, Ester Duflo and Abhijit Banerjee.

The present work brings novel contributions to the discussion about the space occupied by behavioral economics in economic sciences. It differentiates itself from other bibliometric efforts in behavioral economics (Geiger, 2017) and Costa et al. (2019) on two avenues: 1) the search scope for articles was expanded using a large selection of general and area-specific topics; 2) the scope of analysis of publications was reduced, being restricted only to leading publications. The final product is a broader overview of publications at the level of coverage of behavioral economics. It is also more restricted regarding publication selection criteria, limited only to the best-ranked journals in economic sciences. Nevertheless, this approach carries with it a significant limitation, which is the absence the analysis of seminal publications for the area, but which was not first published in mainstream economic journals, such as "The Framing of decisions and the psychology of choice" by Tversky and Kahneman (1981) published in Science and "Mental accounting and consumer choice" by Thaler (1985) published in Marketing Science. .

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