"CATALYSTS OF SUCCESS" – COMPARING HUNGARIAN RESEARCHERS' PUBLICATION PATTERNS TO THOSE OF INTERNATIONAL AWARD-WINNING RESEARCHERS IN THE FIELD OF CHEMISTRY

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ABSTRACT: *This study investigates how the publication practices of Hungarian researchers in the field of chemistry align with the global benchmarks set by award-winning scientists in 2022. Prestigious awards enhance already notable visibility and serve as quality measures of research output. Our analysis of 2022 Scopus-indexed publications assessed international award winners, members of the Hungarian Academy of Sciences, and Hungarian chemistry publications overall, focusing on publication frequency, citation impact, and research topic prominence. Results indicate that award-winners predominantly publish with the American Chemical Society (ACS), while Hungarian researchers favor lower-tiered MDPI journals, impacting their global visibility. Additionally, the most popular research topics among Hungarian researchers do not fully align with those of award winners. To improve the global standing and award prospects of Hungarian researchers, we recommend aligning publication practices with international standards, particularly by increasing submissions to high-impact journals published by the ACS or other prestigious publishers supported by strategic policies.*

KEYWORDS: *international awards, scientific excellence, chemistry, scientific achievement, Hungary*

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INTRODUCTION

International prizes are symbols of recognition of social and scientific excellence (Frey–Neckermann 2009). In academia, prizes are established to promote scientific endeavors and are awarded to scientists who have achieved exceptional results or show the promise of making significant advances in a particular field of research (Ren et al. 2022). Promotion is also an incentive; scientific, prestigious awards are not only financially rewarding but can also demonstrate research talent, motivation, and high social status, as well as generate researcher loyalty and recognition towards the awarding institution (Frey 2006; Zheng–Liu 2015). Beyond individual and institutional recognition, awards can also create opportunities for improving researcher inclusiveness (Kirk et al. 2023). In the latter regard, the research of Kirk et al. is noteworthy: the authors showed that awards have identity-specific implications and that the more diverse an award committee is, the more equal the distribution of awards according to gender and other characteristics (ibid.).This can be seen as an important finding in light of the need to break down the stratification of science and the unequal distribution of rewards for research (Zuckerman 1970) and reduce gender discrimination (Barres 2006).

Although scarcely used as an indicator in various rankings, partly due to the lack of uniform standards, awards significantly increase the visibility of researchers' work and serve as a suitable indicator for measuring the quality of research (Gallus–Frey 2017; Meho 2020). Winning international prizes is thus of paramount importance from both an academic visibility and a practical perspective – it serves as a 'symbol' for the recipient researcher of the importance and quality of their scientific output and can also raise the international standing and reputation of an institution (Gallus–Frey 2017; Meho 2020), while awards also strongly correlate with renowned scientific advances (Ma–Uzzi 2018). The question is, however, to what extent do publication habits, taken as an indicator in science metrics (Abt 1992), correlate with the awarding of prizes; are there patterns that may create the possibility of drawing conclusions about how much and in which journal a researcher publishes and to what extent this shapes their chances of winning an international prize?

The relation between international awards or grants and publication, or in a broader sense, research performance, has a rich literature. In their seminal work, *Social Stratification in Science*, Jonathan R. Cole and Stephen Cole (1973) analyzed how scientific productivity correlates with recognition, such as awards and honors, finding that a small number of scientists receive a disproportionate share of recognition, highlighting the stratified nature of the scientific community. Robert K. Merton (1968) accentuated this theory earlier in relation to publication performance and overall "research visibility" via the Matthew effect, the phenomenon whereby already well-recognized scientists tend to receive disproportionately more credit and rewards than less-known researchers, even when their contributions are similar. Goodell (1977) also underlined the role of awards in terms of acknowledgment and visibility in his work, *The Visible Scientists,* and so did Gianfranco Pacchioni (2018) from a more theoretical standpoint, claiming that awards are pinnacles of a scientific career when writing anecdotes on scholars working in the fields of natural sciences. Closer to our research, Vinkler (2015) outlined the correlation and patterns between scientific degrees – including awards, such as the Nobel Prize – and publication performance, highlighting that scientometric tools and indices are not only eligible metrics but necessary ones when evaluating research excellence. With regard to metrics, it is also important to mention the relevance of the use of acronyms in the field of natural sciences. Acronyms in the natural sciences, especially in chemistry, where they have become a fundamental part of knowledge production and instrumental elements of nearly all publications (Barnett–Doubleday 2020), represent milestones of groundbreaking research and are enduring scientific contributions. Essentially, these terms are not merely shorthand; they symbolize foundational discoveries that have revolutionized entire disciplines (Kragh 2023). One may rightly argue that being immortalized through an acronym or constant represents one of the greatest acknowledgments a scientist can achieve in the natural sciences. Examples include the Planck constant (*h*), named after Max Planck, the Friedel–Craft reaction (Charles Friedel and James Crafts), and the Avogadro constant (NA), named after Italian scientist Amedeo Avogadro. This form of recognition transcends generations and technically "embeds" a researcher's name and contributions into the foundational corpus of science while also demonstrating the profound and lasting legacy of individuals whose discoveries (re)define their fields.

In our research, we examined the field of chemistry in the context of international awards and publication patterns through a case study of Hungary for the year 2022. The reasons for the choice of the topic are twofold. On the one hand, the development of the discipline of chemistry has shown unparalleled dynamism in recent decades (Boyack et al. 2009; Ciriminna et al. 2023). Research by Ciriminna and co-authors (2023) shows that research in the discipline of chemistry accounts for a significant share of the global output of science and engineering (S&E) and that in 2014, chemistry became the most concentrated area of scientific publishing within the 'oligopoly' of the S&E disciplines associated with the major publishers (Elsevier, Springer, Wiley-

Blackwell, American Chemical Society and Taylor & Francis) (Larivière et al. 2015). The above-mentioned dynamic development can be observed both in the number of researchers and the number of journals published in the field of chemistry, with a parallel increase of about 50% in the citation rate of papers published in this field (Ciriminna et al. 2023). On the other hand, the number of publications in Hungary and the number of publications by Hungarian researchers in international journals (especially D1 and Q1 journals[2]) in the field of chemistry is outstanding among the disciplines, both in terms of the number of publications and citations (Nature Index n.d.). Náray-Szabó (2006) also points out that Hungary's role in chemistry research is historically prominent, citing world-renowned researchers such as Albert Szent-Györgyi, György Hevesy, Géza Zemplén and George Olah. Szucs (2015) stresses that in Hungary, in addition to research results, chemistry also plays an important role in industrial and infrastructural development. However, it is important to briefly discuss the scientific situation in Hungary before describing the study. At the regional level, especially in Hungary, measuring and improving science performance is a priority (Sasvári–Urbanovics 2019). Hungarian science policy places particular emphasis on science, technology, engineering and mathematics (STEM) fields, including chemistry, with the aim of fostering research excellence (Kersanszki–Simonics 2022). This focus aligns with the prominence of natural sciences in the country's academic output, as evidenced by the high volume of internationally recognized publications and citations in chemistry (Náray-Szabó 2006; Szucs 2015). Countries may choose to use international repositories and indexing sites, or they can create their own local repositories that are adapted to the publication policies and assessment needs of their own communities (Sasvári–Nemeslaki 2019). Hungary is in a unique position in this respect, as it has chosen the latter approach, i.e., it not only considers the Scopus or WoS databases, which are generally used as a basis for science metrics but aims to create a comprehensive database of the scientific output of Hungarian researchers, resulting in an accredited and central publication repository, the Hungarian Repository of Scientific Works (HRSW) (ibid.). This dual approach has, however, had a highly controversial impact. Some have argued that the HRSW does not follow the Scopus database evaluation system but an alternative one, which often contradicts international standards (Csaba et al. 2014), while others, citing the Matthew effect mentioned above, have expressed concern that Hungarian researchers may be marginalized by this Hungarian database tracking (Demeter 2017).

2 D1 journals belong to the top 10% of the journal ranking in their discipline according to Scimago citation metrics. Q1 journals belong to the top 25% of journals within their discipline.

Nonetheless, it should be mentioned that in the natural sciences, institutional standards and evaluation usually consider and often prioritize metrics associated with international repositories (cf. Beck–Gáspár 1991).

In our research, we also segmented the scientific performance of Hungarian researchers by their status in the field of chemistry. Here, we examined separately all researchers working in the field of chemistry and a specific segment of this set, the academics and possessors of PhDs at the Hungarian Academy of Sciences (HAS). For a more specific examination, it is worth briefly introducing the specific system of Hungarian academic degrees, the study by Sasvári and Nemeslaki (2019: 129–130) being the guiding document in this respect. In this, it is important to distinguish between the current degree system and the researcher qualification system. The former can be described as follows:

1. *BSc and MSc degrees*. As with the vast majority of higher institutions, universities award these degrees as foundational academic qualifications.
2. *PhD degree*. The PhD degree is the highest official scientific degree currently awarded by universities in Hungary. Similar to other European academic degree systems, the PhD degree is awarded to a researcher who successfully defends a doctoral thesis affiliated with a doctoral school of a Hungarian higher education institution. It should be noted that although the *Candidate of Science* (CSc) degree – formerly adopted from the Soviet scientific system – no longer exists, it is equivalent to the PhD. The CSc is awarded by the Scientific Qualification Committee, or in practice, the discipline-respective committee of the HAS.
3. *DSc degree*, i.e., the Doctor of Science degree. The DSc degree is the highest and most prestigious scientific qualification in Hungary (Csomós 2020). This qualification was historically conferred by HAS committees, and the title referred to the researcher's respective field (e.g., Doctor of Chemical Science). The PhD (or CSc) degree was and still is a prerequisite for this degree. Today, this title may be awarded to PhD holders who demonstrate exceptional research achievements and fulfill rigorous evaluation criteria. The rules for the award of the DSc degree vary according to the discipline and are specified by HAS according to its own discipline-based classification. In the field of chemistry (VII. Section of HAS), international publications and the number of independent international citations are of particular importance.

Another typology may be introduced based on career-stage classifications, see Table 1.

Table 1. *Typology of researchers based on career-stage classification*

Category	Description
Young Research Scientists and Assistants	Early-career researchers, including research assistants and postgraduates.
Senior Research Scientists and Assistant Professors	Mid-career researchers in senior academic roles.
University Professors and Team Leaders	Established researchers leading teams at universities or research institutes.
Corresponding Members of the Academy	Researchers elected as corresponding members of the Hungarian Academy of Sciences.
Full Members of the Academy	Senior researchers who are full members of the Hungarian Academy of Sciences.

In the present study, the categories of the second and third levels, i.e., DSc degree holders and Academicians (i.e., Corresponding and Full Members of the Academy in Table 1), are analyzed together (hereinafter abbreviated as HASAD).

In order to analyze awards and publication patterns in the field of chemistry, we examined four research questions (RQ):

- RQ1: What are the publication patterns and characteristics of international award winners, and how do they compare with those of Hungarian researchers in chemistry?
- RQ2: What publication patterns characterize international award-winning researchers, particularly with regard to their choice of publishers?
- RQ3: What trends can be observed in the correlation between publication activity in the chemical subfields and awards (global and domestic)?

The aim of this research is to identify and establish patterns that can serve as guidelines for Hungarian researchers in the field of chemistry. In this context, we will also make recommendations concerning the field of publication and science policy with a view to increasing the number of Hungarian international award winners.

METHODOLOGY

In our study, we considered two indicators: publication activity and international awards. The empirical analysis of publication activity is based on the Scopus database of publications indexed by Scopus in 2022. The examination is based on the empirical analysis of the publication performance of

1. international award winners (international excellence),
2. HASAD (Hungarian excellence),
3. all Hungarian researchers in chemistry (Hungarian visibility).

It is imperative to provide a brief conceptualization of what we refer to as "excellence" and "visibility," two terms that are closely interconnected with awards (Frey 2013). Scientific excellence is an utterly complex, multidimensional concept (Abramo et al. 2008), which is usually defined in scientometrics via a combination of elite set indicators, such as the proportion of publications in top-tier journals (e.g., D1/Q1 journals), the *N* of *h*-index, the frequency of highly cited publications, and the relative contribution of a researcher or institution to the field's output (Hirsch 2005; Vinkler 2021; Vîiu 2016). Excellence also encompasses the innovative and transformative potential of research, as reflected in groundbreaking discoveries or paradigm-shifting contributions (cf. Sen 2013; Gravem et al. 2017; Nagy et al. 2023). By visibility, on the other hand, we aim to pertain the term to the degree of recognition and prominence a researcher, team, or institution achieves within the global scientific community (Katz et al. 1997; Hirsch 2005). The other key term in our research, "visibility," is closely related to excellence and is often operationalized through metrics such as citation impact, the breadth of international collaborations, and the strategic choice of high-impact journals as publication venues.

The categories used by Scopus are as follows:

1. Analytical chemistry
2. Chemistry (miscellaneous)
3. Electrochemistry
4. Inorganic chemistry
5. Organic chemistry
6. Physical and theoretical chemistry
7. Spectroscopy

As a separate indicator for RQ1, the popularity of each subject was also examined. The Topic Prominence Percentile (TPP) is an indicator that measures the importance and prominence of a given research topic within the scientific community. The value is expressed as the percentage of research topics that are ahead of the average topic in terms of prominence. The higher the percentage value, the greater the prominence of the topic (Cardoso et al. 2021). The purpose of including TPP is to provide an additional verification tool for the findings, in addition to examining the publication performance of award winners and Hungarian researchers.

For the purposes of international awards, we have considered awards that have been given to individuals associated with institutions in more than one country over the last 10 years (for annual awards) or over the last 20 years for awards given once every two or more years. This means that qualification for an international award is conditional on its inclusion in one of the following seven databases:

1. A list of "prestigious" awards (n = 191) compiled by experts in the field in 2006 and used by the US National Research Council to assess the quality of doctoral programs (National Research Council 2011).
2. Science.gc.ca – the official science and technology resource of the Government of Canada (n = 135), compiled and updated in 2018.
3. List of 95 awards from the International Congress of Distinguished Awards 2014, categorized as "most distinguished," "gold standard," "highly regarded," "grand prizes," "challenge awards," and "prototype awards" (ICDA n.d.).
4. List of 63 Wikipedia prizes that fall into the category of "prizes known as Nobel Prizes in a field" (Wikipedia n.d.).
5. List of 30 awards used annually by the Center for World University Rankings (CWUR).
6. The Shanghai Ranking (2019), a list of 26 prizes considered "best" by 454 professors from 84 institutions in 15 countries.
7. A list of 20 medical research awards, described by Naylor and Bell (2015) as "the Himalayas of excellence in medical research."

It is critical to highlight that it is disputed whether awards in a specific field can be classified or ranked. The reason behind this stems from multiple issues. First, different awards are associated with varying criteria and standards, making it challenging to establish a uniform ranking system (Meho 2020; Zheng–Liu 2015; Vernon et al. 2018). Second, even with awards based on comparable criteria, the subcriteria are more often than not based on different metrics, indices, or factors (Chen et al. 2023). Though it is to be acknowledged that attempts have been made to standardize prizes and awards and their values (cf. Bornmann–Haunschild 2024), given that there is no universally accepted awards ranking metric or database, we did not differentiate based on the supposed or perceived prestige of awards.

Last, to assess publications more thoroughly, we used the SJR value/indicator for each publication exported via SciVal. The SJR (SCImago Journal Rank) is a metric used to assess the scientific impact of scholarly journals. It is calculated by considering the number of citations connected to a journal's articles and the reputation of the journals from which those citations originate (Colledge et al. 2010). The SJR value is, therefore, elevated by the prestige of the journal in which the citation occurs, and the metric also excludes self-citations, making this indicator highly reliable and trustworthy (ibid.). For RQ3 specifically, we considered the Field-Weighted Citation Impact (FWCI) metric, too. The FWCI, a bibliometric metric, assesses the impact of a publication by comparing the number of citations it receives to the average for similar publications in the same field, year, and document type (Zanotto–Carvalho 2021; Sasvári–Lendvai 2024). A value of 1.0 signifies global average citations, while values above 1.0 indicate above-average impact, and those below 1.0 suggest a lower-than-average impact. As this metric normalizes for field-specific citation practices, FWCI offers a robust measure of a publication's prestige and influence, emphasizing its relative performance within its academic context rather than solely relying on raw citation counts (Purkayastha et al. 2019).

RESULTS

A total of 276 international prizes are awarded based on the Meho database (2020). The largest number of international prizes is awarded in the field of life sciences, medicine, and health (58), with the largest number of winners (1270). A total of 27 international prizes are awarded in the field of chemistry, with 192 winners in the period under review. It is important to note that the concentration of prizes (total prizes as a proportion of total winners) is particularly low in the field of chemistry, being 21% of that for the life sciences, medicine, and health. This ratio presupposes that chemistry is an "individual" field compared to other disciplines, as awards are distributed among fewer researchers, i.e., awardees work in smaller research groups and collaborate (Table 2).

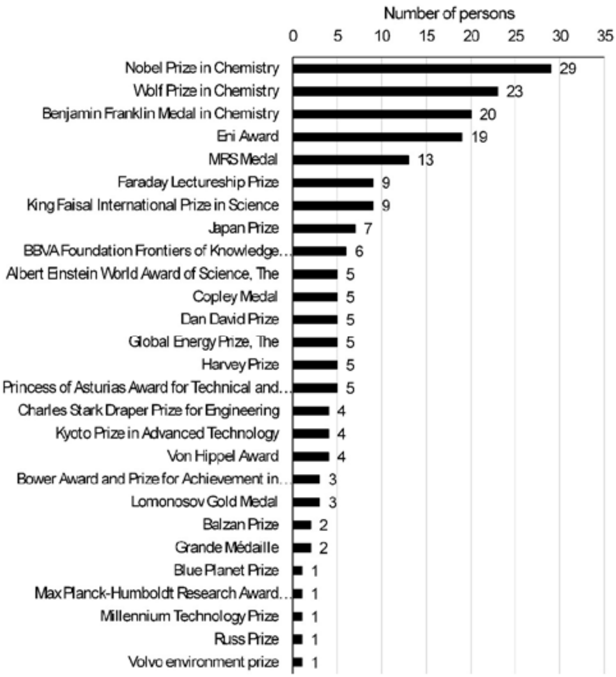
Table 2. *Awards and number of awardees included in the full survey*

Ranking	Subject area	Number of awards	Number of awardees
1	Astronomy	21	191
2	Life sciences, medicine, and health	58	1270
3	Physics	37	371
4	Earth sciences	28	234
5	Chemistry	27	192
6	Mathematics	29	310
7	Engineering sciences	27	262
8	Computer science	19	192
9	Social sciences	30	423
	Total	276	3445

Source: Based on Meho (2020).

In chemistry, the Nobel Prize (29) and the Wolf Prize (23) are the most frequently awarded prizes, with the Benjamin Franklin Medal in Chemistry (20) and the Eni Prize (19) being the other major prizes awarded over a 20-year time span (RQ1) (Figure 1).

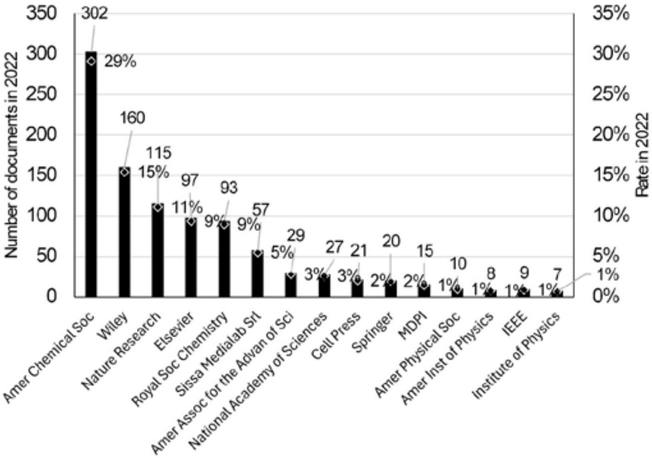
Figure 1. *Number of international awards and laureates in chemistry*



Source: Based on Meho (2020). See Appendix 1 for more details.

To investigate the correlation between publications and international prize-winning, we analyzed Scopus database data to identify the publisher of the international prize-winners (RQ2). In 2022, the prize winners published 1,037 papers, a very significant proportion (29%, 302 papers) of which were published by American Chemical Society (ACS). The number of laureates in Wiley, Nature Research, Elsevier, and Royal SC is relatively high, significantly less than with ACS. There is a strong correlation between publishing in ACS and winning prizes; the outstanding performance of ACS suggests that ACS is the publisher most preferred by the prize winners, i.e., the most respected researchers. At the same time, it is explicitly careful to publish the prize winners, thus achieving a kind of "reciprocity of excellence" in terms of the relationship between the prize winners and the publisher (Figure 2).[3]

Figure 2. *Publication performance of international award-winning authors by publisher in 2022 (n=1037)*

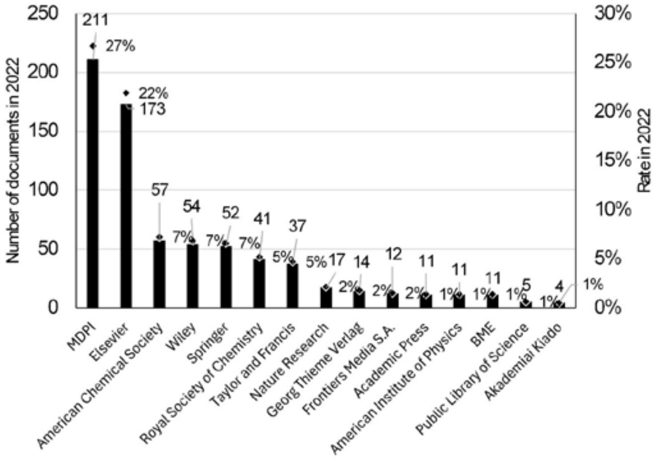


Source: Based on Scopus database.

Following the international publication and award patterns, we examined the performance of HASAD in the VII. Section of the Hungarian Academy of Sciences to compare the data with international results (RQ1). These researchers published a total of 790 papers in 2022, not particularly different in proportion to the publication productivity of international awardees. However, there is a notable difference concerning which publishers the international awardees and HASAD publish with. While only a minority of the awardees publish in journals of the Multidisciplinary Digital Publishing Institute (MDPI) (15 publications, 1% of all publications), the vast majority of HASAD publish in MDPI journals (211 publications, 27% of all publications). A corresponding result of this divergence is that while ACS is a particularly popular publisher for international award winners, only 7% of all HASAD publications appear in ACS publications. The popularity of Elsevier journals among HASAD is outstanding (173 publications, 22%) – about twice as large as the proportion of international award winners with Elsevier publications (97 publications, 9%).

3 Details and descriptions of the international awards are given in Appendix 1.

Figure 3. *Publication performance of HASAD of the VII. Section of Chemical Sciences of the HAS by publishers in 2022 (n=790)*

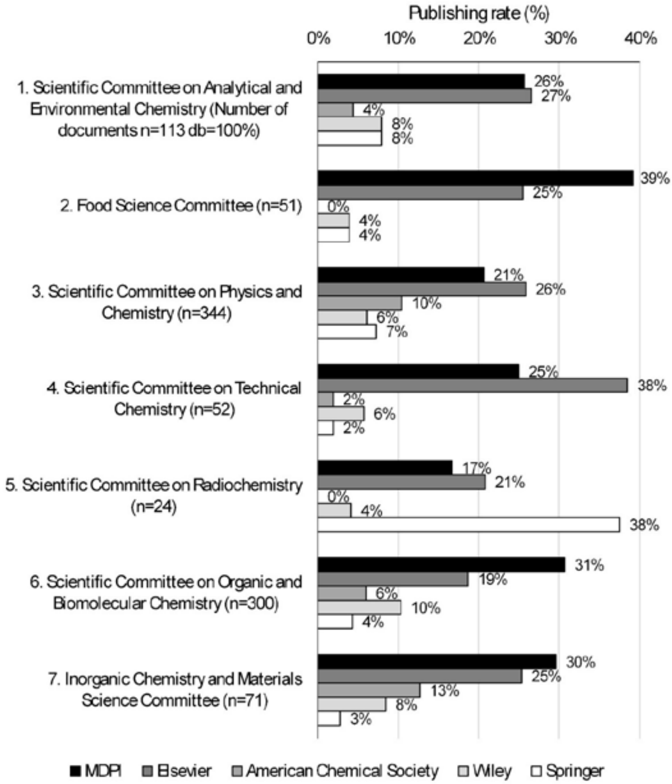


Source: Based on Scopus database.

The scientific publication habits of the seven scientific committees of the VII. Section of Chemical Sciences of the Hungarian Academy of Sciences were examined separately. Correlated with the publication habits of international award winners, we find that although there are differences in publisher preference – MDPI and Elsevier alternatively lead the preference list in some committees, and Springer is the leading publisher in the Radiochemistry Scientific Committee – ACS is a marginal publisher in all committees, with no committee having a publication share of more than 15% (Figure 4).

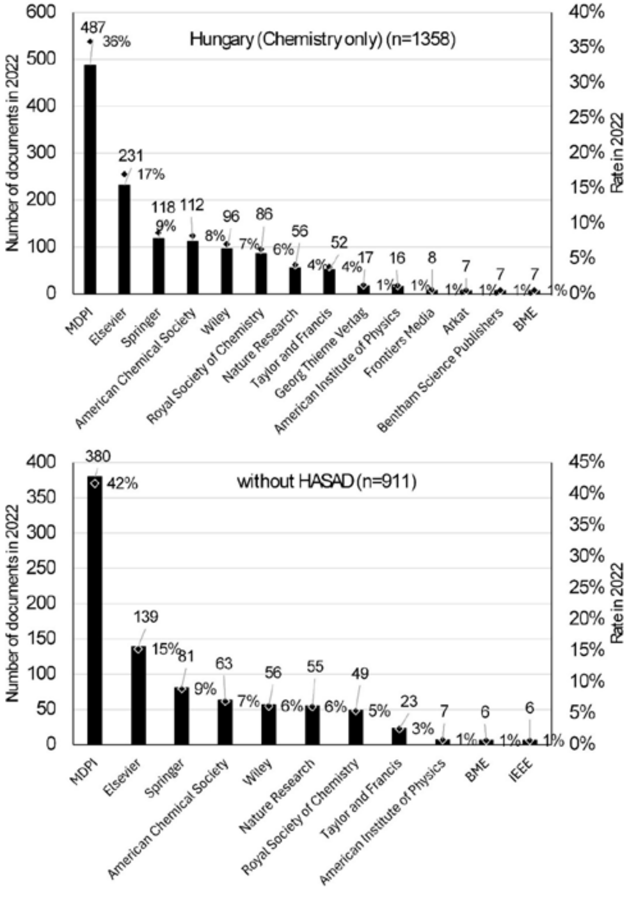
Putting the results of Figures 3 and 4 in a broader context, the popularity of the MDPI becomes even more prominent when we broaden the scope of Hungarian researchers beyond HASAD to authors publishing in the field of chemistry (a total of 1,358 publications) (487 publications, 36%, without HASAD 380 articles, 42%). This means non-HASAD researchers prefer to publish their papers in MDPI even more strongly (Figure 5).

Figure 4. *Publication performance of HASAD of the VII. Section of Chemical Sciences of the HAS by committee and publisher in 2022*



Source: Based on Scopus database.

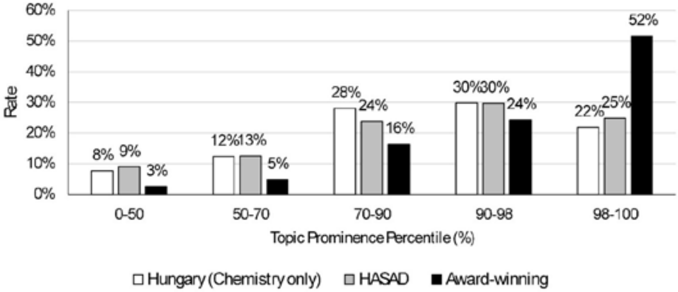
Figure 5. *Publication performance of Hungarian authors as publishers in 2022 (n=1358)*



Source: Based on Scopus database.

Considering TPP, it can be observed that regarding the most popular topics (TPP 98–100%), international award winners (52%) outperform Hungarian researchers by a large margin (25%; 22%). However, a clarification is that the representation of Hungarian researchers is high (30%; 30%) in particularly popular topics (TPP: 90–98%), while in the unpopular (TPP: 0–50%) and less popular (TPP: 50–70%) areas it is relatively low (albeit still several times higher than that of international award winners) (Figure 6).

Figure 6. *Popularity of publications in the field of chemistry by topic for the groups studied in 2022*



Source: Scopus and SciVal database.

We examined the distribution of award winners, HASAD, and all publications in Hungary separately. The three areas under consideration show similar trends, with physical and theoretical chemistry and organic chemistry leading the way in the publications of both award winners (18% and 10%), HASAD (45% and 41%), and researchers in Hungary (43% and 37%). This similarity highlights that Hungarian researchers publish in journals similar to those of the award winners, but it would be advisable to publish in the journals of the specific disciplines in which award winners are also published. It is noteworthy that, in terms of awards and specific chemistry disciplines, analytical chemistry is very weakly represented in the field of international awards, while physical and theoretical chemistry are associated with a higher rate of awards (12 out of 27 awards are most likely to be internationally awarded) (RQ1; RQ3).

It is crucial to highlight two matters when reading the chart included below. First, a publication can be categorized into multiple categories; if this is the case for a respective publication, we counted it in both (or multiple) categories (disciplines). Second, most cases of publishing in chemistry involve co-authorship, thus the fact that an international awardee may win more than one award and a HASAD scholar may be a part of more than one committee means that the percentage-based metrics do not reflect the total (100%) but rather multi-criteria-based subsets of all factors under consideration. In brief, this means that one publication may be classified into multiple disciplines and groups, and the percentiles merely serve as representative measures rather than dividends of a total count (Table 4 and Appendix 3).

Table 4. *Distribution of publications among award winners in chemistry, HASAD, and all researchers in Hungary by discipline in 2022 (%)*

Name	Total number of articles	Articles in chem-istry	Analyt-ical chem-istry	Chem-istry (miscel-laneous)	Electro-chem-istry	Inor-ganic chem-istry	Organic chem-istry	Physical and theoret-ical chem-istry	Spec-troscopy
Total number of awardees	1033	56%	3%	5%	4%	7%	10%	**18%**	2%
Total HASAD	790	58%	21%	12%	2%	20%	41%	**45%**	19%
Hungary (Chemistry only)	1387	100%	19%	10%	2%	23%	37%	**43%**	24%

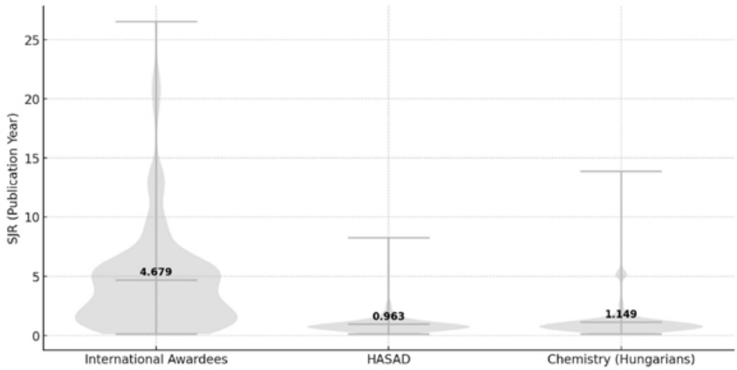
Explanation:

N.D.= No data	Highest rate	Second highest rate

Source: Based on Scopus and SciVal data.
Note: For details, see Appendices 2 and 3.

Finally, we assessed publications in terms of their SJR value. As mentioned in the Methods section, the usage of SJR to qualify and assess the prestige of a respective publication is a more comprehensive choice than using simply the Q quartile assigned to a journal or solely measuring the impact factor of a journal as the SJR is based on a broader coverage and does not overemphasize citation count unlike the impact factor (Fazel–Wolf 2017). The analysis of the SJR across the three categories revealed notable differences in publication quality and spread. International awardees have the highest mean SJR value by far at a value of 4.68 with, however, a substantial standard deviation of 4.55, reflecting a broad range of journal quality, including publications in the most prestigious venues. In comparison, HASAD publications present a significantly lower mean SJR of 0.96 and a tighter spread (standard deviation 0.87), which can, on the one hand, be traced back to the smaller number of publications than in the other two categories; on the other, this also indicates that papers from this group are published predominantly in mid- to lower-ranked journals. Similarly, the Hungarian scholars working in chemistry, though having a slightly higher mean SJR of 1.15, are still falling significantly short of the international awardees' results. We highlight the differences in the violin plot below, which indicates the dense concentration of lower SJR values for HASAD and Hungarian scholars working in chemistry, while the international awardees exhibit a much broader distribution, which includes numerous high-impact publications.

Figure 7. *Violin chart of publications' SJR values according to categories examined*



Source: Authors' construction from Scopus and SciVal database.

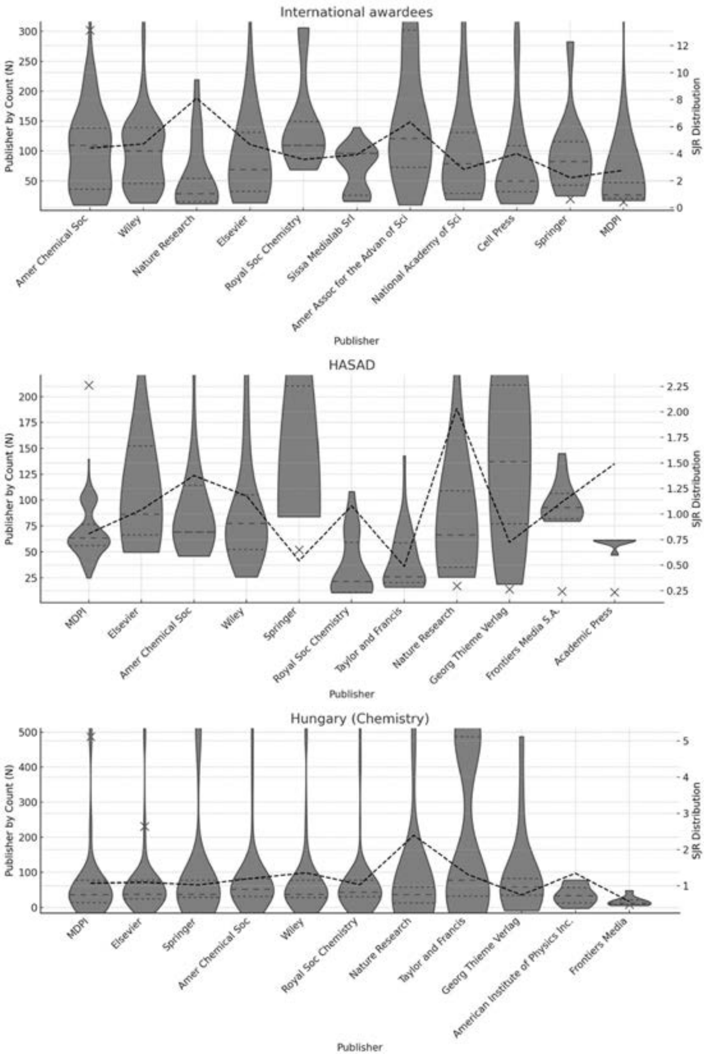
The above findings are even more important in terms of publication strategies, taking into account the aforementioned preferences with regard to publishers. Naturally, each publisher offers different venues of often vastly different quality (e.g., there is a difference between one MDPI journal and another). Therefore, we averaged the SJR value of each publisher for the three categories and merged the count of publications, and the SJR value results into one complex illustration.

Our results show with great clarity that the issue of choosing journals and publishers is even more systemic than presented above. International awardees not only prefer to publish in journals with higher SJR values but also, in the case of publishers that all three categories share, international awardees publish in better journals than either of the Hungarian categories. This is further confirmed in the case of Wiley, Nature Research, Elsevier, and most importantly for Hungarian scholars, as it is seemingly the most popular venue, MDPI.

Therefore, it is recommended that Hungarian colleagues choose MDPI and Elsevier journals for publishing due to international awardees' preferences. As a journal's SJR increases, the visibility and citeability of articles submitted to it will also rise (Figure 8).

Last, to provide a micro-level analysis, we assessed the top 10 journals for each category, including their publisher, their SJR value, and the mean FWCI score of the publications in the respective journal. This examination was crucially important as it also accentuates two further issues. First, international awardees publish vastly different papers than their Hungarian peers. This not only transpires as overperformance in terms of the SJR value of a journal, which elevates a publication's visibility and prestige but also in terms of the mean FWCI counted per publication, which is – in most cases – higher than Hungarian publications' mean FWCI score.

Figure 8. *Comprehensive comparative charts according to publishers and average SJR value of their journals by the three examined categories*



Source: Authors' construction from Scopus and SciVal database.

There is also an intriguing pattern to consider, namely, the non-existence of MDPI among the top 10 journals for international awardees and its overrepresentation among Hungarians (5 of 10 journals for both HASAD and other Hungarian colleagues). As a proposal for a publication strategy, it is critically important to take into account award-winners' publication patterns as they also guarantee more micro-level "success" (Table 5).

Table 5. *Top 10 journals according to categories examined*

	Rank	Journal	Publisher	N	Mean_ SJR	Mean_ FWCI
International awardees	1	Journal of the American Chemical Society	American Chemical Society	61	5.945	3.500
	2	Proceedings of Science	Sissa Medialab Srl	34	–	0.603
	3	Angewandte Chemie – International Edition	Wiley	26	5.573	2.157
	4	Chemistry of Materials	American Chemical Society	23	2.869	1.453
	5	Nature Communications	Nature Research	21	5.116	5.240
	6	Science Advances	American Association for the Advancement of Science	14	4.598	4.124
	7	ACS Nano	American Chemical Society	12	4.728	1.373
	8	ACS Catalysis	American Chemical Society	12	4.195	1.558
	9	Proceedings of the National Academy of Sciences of the United States of America	National Academy of Sciences	12	4.026	1.813
	10	Journal of the American Chemical Society	Wiley	11	5.945	2.423
HASAD	1	Molecules	MDPI	42	0.704	0.513
	2	International Journal of Molecular Sciences	MDPI	35	1.154	0.599
	3	Pharmaceutics	MDPI	18	0.795	0.988
	4	Journal of Molecular Structure	Elsevier	16	0.482	0.491
	5	Journal of Molecular Liquids	Elsevier	13	0.914	0.270
	6	Phosphorus, Sulfur, and Silicon, and the Related Elements	Taylor and Francis	13	0.235	0.064
	7	Synthesis (Germany)	Georg Thieme Verlag	12	0.744	0.288
	8	Catalysts	MDPI	12	0.690	0.371
	9	Scientific Reports	Nature Research	12	0.973	0.825
	10	Nanomaterials	MDPI	11	0.811	0.306
Hungary (Chemistry)	1	International Journal of Molecular Sciences	MDPI	109	1.154	0.661
	2	Molecules	MDPI	36	0.704	0.754
	3	International Journal of Molecular Sciences	Elsevier	31	1.154	1.886
	4	Sensors	MDPI	22	0.764	1.118
	5	International Journal of Molecular Sciences	Springer	19	1.154	0.5
	6	Nature Communications	Nature Research	19	5.116	2.289
	7	Molecules	Elsevier	15	0.704	0.797
	8	Symmetry	MDPI	15	0.483	2.021
	9	International Journal of Molecular Sciences	American Chemical Society	14	1.154	0.439
	10	Polymers	MDPI	14	0.72	0.601

Source: Authors' construction from Scopus and SciVal database.

DISCUSSION

Looking at the discipline of chemistry, there is a clear relationship between international award winners and their publication activity; award winners are most likely to publish with the ACS, and, in line with this, the ACS is most likely to publish award winners' work (RQ1; RQ2). In the subfields of physical and theoretical chemistry and organic chemistry, researchers in the subfields of analytical chemistry and spectroscopy are most likely to be awarded prizes, while in the subfields of analytical chemistry and spectroscopy, the probability of being awarded prizes is negligible (RQ3). This result also partly reflects the publication performance of Hungarian researchers, as publication activity in the subfields of physical and theoretical chemistry and organic chemistry dominates publication trends in Hungary. However, there is a difference in the publication activity of international award winners in that analytical chemistry is the third most popular subfield among Hungarian researchers and is associated with a very low probability of winning an international award (RQ3).

In terms of Hungarian and international publication activities, we identified the following results. Data show that chemists who received international awards published a negligible proportion of their publications in journals managed by MDPI (Figure 2). In contrast, the largest proportion of HASAD publications, more than a quarter, were published in MDPI in 2022 (Figure 3), ahead of Elsevier. In addition to the risks already identified (Oviedo-García 2021), this result suggests that scientific excellence and scientific visibility can sometimes be sharply separated. This gap is most striking for ACS-published papers. Indeed, publishing international laureates in an easily perceptible way in ACS publications creates a limited "elite publisher" that not only publishes the laureates' publications but also generates a group of researchers who will be laureates. While this synergy is minimal in the case of Elsevier when comparing international award winners with Hungarian researchers, there are stark differences in MDPI-related publications.

In this context, it is recommended to explore in more detail the publication habits of international laureates and, in this context, the institutional, research, and co-author network of laureates – not least in order to enable Hungarian researchers and authors to find their way to new institutional, research and publication opportunities that aim for excellence. This is also worth considering as the award winners and Hungarian researchers publish in similar chemical subfields, and even taking TPP into account, there is a similarity in the prominence of topics. The difference is, therefore, not in the topics researchers publish in but in the journals they publish in. We propose a better alignment of publishing preferences with the habits of international awardees, and in this context, we find it justified to promote and publicize ACS-published journals among Hungarian researchers to support the inclusion of the latter in the group of awardees detailed above. From a scientific policy perspective, we also recommend that the financial support necessary for publication in ACS journals be provided and that publication grants be extended to this issue. These considerations could improve the effectiveness and visibility of researchers in the field of chemistry in Hungary in several ways. They could also help to bring marginalized Hungarian researchers who are currently on the periphery of international high-profile prizes closer to the 'core' of the scientific community (Demeter 2017).

CONCLUSIONS

This study employs a single-year dataset for the year 2022 as the basis for analyzing the publication activity of Hungarian researchers in the field of chemistry. We understand and wish to highlight that a broader temporal scope could provide additional insights into longitudinal trends and that our applied approach primarily offers a concise – and timely – "snapshot" of current publication practices and their alignment with international standards. The decision to focus on 2022 was informed by two practical considerations. Our aim was to capture recent trends that reflect ongoing shifts in publication strategies and the visibility of research of Hungarian scholars. Nonetheless, it is critical to note that this single-year focus limits the scope of conclusions regarding the full career trajectories of researchers, particularly for senior scientists, whose publication activity may have peaked earlier in their careers. Consequently, we propose that this analysis should be viewed as a "situational report" rather than a longitudinal assessment. We are confident that this study provides meaningful insights into the current state of scientific visibility and excellence, which are valuable for informing policy recommendations and making strategic adjustments in publication practices.

Limitations

In the broader field of scientometric research, elite set indicators and indices such as the *h*-index, *g*-index, and π-index have become widely accepted as robust measures of research impact and excellence (Hirsch 2005; Egghe 2006; Vinkler 2009). Though their utility is undoubtedly instrumental in research evaluation, the present study mainly focused on the patterns and practices of publication among Hungarian researchers and their alignment with internationally recognized benchmarks set by award-winning researchers. Our core aim was to understand how publication habits – such as journal preferences and topical focus – affect global visibility and recognition rather than to evaluate individual researchers' lifetime impact. Nevertheless, we acknowledge that incorporating elite set indicators into future analyses could provide complementary insights, particularly for examining the relationship between long-term scientific excellence and the likelihood of receiving prestigious awards. Also, while this study provides valuable insights into publication practices, future research could refine these comparisons by analyzing equivalent fractions of the research communities (e.g., the top 1% based on citation impact or *h*-index) and incorporating demographic data to account for variations in age and career stage. Last, the comparison between international award-winning researchers and HASAD members is inherently influenced by structural differences between the groups. Award-winning researchers are likely to represent the top 1% of their respective research communities globally, while HASAD, though representing the top of the Hungarian scientific community, encompasses a broader subset of Hungarian researchers in the field of chemistry.

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APPENDICES

Appendix 1: Description of awards

Available: https://docs.google.com/document/d/17R_6OD8oyUjEhVu8G7p-TiR4b6Fot_WQx/edit?usp=drive_link&ouid=100423442861719551356&rtpof=true&sd=true

Appendix 2: Distribution of publications among award winners in chemistry, HASAD, and all researchers in Hungary in 2022

Available: https://docs.google.com/spreadsheets/d/1D9bCMZY8tBgYOS-ghWPJe9B41K8abLs-4/edit?usp=drive_link&ouid=100423442861719551356&rtpof=true&sd=true

Appendix 3: Table 3 details

Available: https://docs.google.com/document/d/19r4wTXH1M-cu6eCBH-9MO3ApL-GmfPSUI/edit?usp=drive_link&ouid=100423442861719551356&rtpof=true&sd=true