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Diamond open access and open infrastructures have shaped the Canadian scholarly journal landscape since the start of the digital era

Le libre accès diamant et les infrastructures ouvertes ont façonné le paysage des revues savantes canadiennes depuis l'ère numérique

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Résumé de l'article

L'édition savante implique de nombreux acteurs ayant des intérêts divers. Au Canada, l'implication des universités, la présence de sociétés et la disponibilité d'un soutien gouvernemental pour les périodiques semblent avoir contribué à un écosystème de revues assez diversifié. Cette étude présente en détail l'état actuel de ces revues, ainsi que les tendances et transformations passées au cours du 20e siècle et, en particulier, de l'ère numérique. À cet effet, nous avons créé un nouvel ensemble de données, comprenant un total de 1256 revues, dont 944 paraissent actives aujourd'hui, en nous concentrant spécifiquement sur les organisations qui soutiennent les revues, les types d'accès, les disciplines, les origines géographiques, les langues de publication et les plateformes et outils de diffusion. Les principales caractéristiques des revues savantes canadiennes sont une présence importante du libre accès diamant, qui a été adopté par 62% des revues, une prédominance des disciplines des sciences sociales et humaines et une faible présence des grands éditeurs commerciaux. L'ère numérique a permis le développement d'infrastructures ouvertes, ce qui a contribué à la création d'une nouvelle génération de revues qui ont massivement adopté le libre accès diamant, souvent soutenues par les bibliothèques universitaires. Cependant, la cessation d'activité des revues a également augmenté, en particulier parmi les revues récemment créées. Ces résultats fournissent des indications précieuses pour la conception de pratiques et de politiques adaptées qui répondent aux besoins des différents types de périodiques et qui tiennent compte de l'évolution des pratiques des revues savantes au Canada.

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Research Article

Diamond Open Access and Open Infrastructures Have Shaped the Canadian Scholarly Journal Landscape Since the Start of the Digital Era

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Scholarly publishing involves multiple stakeholders having various types of interest. In Canada, the implication of universities, the presence of societies and the availability of governmental support for periodicals seem to have contributed to a rather diverse ecosystem of journals. This study presents in detail the current state of these journals, in addition to past trends and transformations during the 20th century and, in particular, the digital era. To this effect, we created a new dataset, including a total of 1265 journals, 943 of which appeared to be active today, specifically focusing on the supporting organizations behind the journals, the types of (open) access, disciplines, geographic origins, languages of publication and hosting platforms and tools. The main overarching traits across Canadian scholarly journals are an important presence of Diamond open access, which has been adopted by 61% of the journals, a predominance of the Social Sciences and Humanities disciplines and a scarce presence of the major commercial publishers. The digital era allowed for the development of open infrastructures, which contributed to the creation of a new generation of journals that massively adopted Diamond open access, often supported by university libraries. However, journal cessation also increased, especially among the recently founded journals. These results provide valuable insights for the design of tailored practices and policies that cater to the needs of different types of periodicals and that consider the evolving practices across the Canadian scholarly journal landscape.

Keywords: national journals, scholarly publishing, open access models, journal list, Canada, languages of publication

Introduction

In today's increasingly internationalized scientific field, it may well seem that Louis Pasteur's adage about science knowing no country is truer than ever. However, to paraphrase the pioneering French biochemist, scholarly journals certainly do. At least, a specific group within scholarly periodical publications: that of national, or domestic journals. These can be defined as journals where researchers from a particular country publish predominantly in order to communicate their research to peers and other interested audiences from that country; and where the actors involved in publication, such as the editorial team and supporting organisms, share a common geographical location (Lange & Severson, 2021; Moed et al., 2021). Domestic journals are also likely to present research topics with a geographically limited scope or having a specific, national or local context (Fortin, 2018; Gingras & Mosbah-Natanson, 2010; Ma, 2019). Thereby, they may be considered opposing "international" journals, which may attract international authorships and readerships, present universal research topics, and often be associated with the Natural and Health Sciences (Gingras, 2014) and multinational, commercial publishers (Larivière et al., 2015).

Domestic journals are the natural channels for the creation of regionally relevant research communities and scholarly networks, especially in the Social Sciences and Humanities (SSH) (Sivertsen, 2016). Because domestic journals often publish in a national language, other than English, they contribute to the overall multilingualism of the scientific field and act as a counterweight to the hegemony of English as the *de facto* sole international language of science (Céspedes, 2021; Pölönen et al., 2021). Language is also a facilitator to attract a wider readership beyond academia, a relevant issue since the contents of domestic journals often cover research agendas of particular interest for local stakeholders such as social organizations, policymakers, and funders.

As the term "national" or "local" has come to often connote lesser value as opposed to "international" (Lillis, 2012), domestic journals are often disregarded by major publishers - and some researchers alike. Canadian scholars, especially in the SSH, tend to shift their research scope, aiming for a less

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specific and more international focus (Larivière & Warren, 2019), which is likely to affect the Canadian scholarly journal landscape. Previous studies have endeavoured to characterize it, ever since the pre-digital era (Gordon, 1984) or during its early years (Boismenu & Beaudry, 2002). In the last decade, the Canadian scholarly journal landscape has been described as highly heterogeneous, with "[...] small and some mid-sized journals that publish quality research findings and other scholarship on a diverse range of subjects" (Paquin, 2016), characterized by a high prevalence of different modalities of open access (OA) (Larivière et al., 2021).

The variety of agents involved in supporting journals is a distinguishing trait of the Canadian scholarly publishing ecosystem. Unlike the United States and Great Britain, Canada does not have a dominance of domestic commercial publishers and internationally oriented journals (Boismenu & Beaudry, 2002; Moed et al., 2021); instead, the majority of Canadian journals are supported by research institutions, professional and learned societies, university libraries and presses, public funders, which may each rely to a variable extent on volunteers (Lange & Severson, 2021; Larivière et al., 2021; Paquin, 2016). The Social Sciences and Humanities Research Council (SSHRC) has provided financial support to Canadian scholarly journals in these research areas since 1979, while the ancestors of the current *Fonds de Recherche du Québec* (FRQ) have supported Quebec SSH journals since, at least, 1981[1]. Furthermore, journals hosted by Érudit, a Quebec-based platform for the dissemination of, mostly, SSH journals, benefit from funding through its Partnership for Open Access, which, as of 2024, redistributes the contributions of more than 90 libraries to support over 250 non-profit journals. There is a consensus that this support is crucial to ensure the sustainability of non-profit journals, particularly in face of the competition of commercial publishers (Canadian Scholarly Publishing Working Group, 2017), which offer perceived benefits related to infrastructure, indexing, marketing and editorial training opportunities, in addition to prestige (Fyfe et al., 2017; Krapež, 2023). Finally, a major, open-source infrastructure for scholarly publishing internationally, Open Journal Systems (OJS) is developed by the Public Knowledge Project, a non-profit organization based in Canada. Internationally, OJS has been adopted by more than 40,000 active journals; naturally, it is a major resource as well for Canadian journals. OJS allows for the management of the editorial workflow, including submission, peer review, and online publication.

Non-profit journals are considered fragile for several reasons. Characterized by low publishing volumes, the support they receive is not always stable, and these journals frequently rely on volunteers and unpaid labour for their everyday activities (Björk et al., 2016; Bosman et al., 2021; Lange & Severson, 2022; Morrison, 2016). Besides, OA mandates may have the undesired side effect of exacerbating the difficulties in their financing. As mentioned, commercial publishers, even if they have a lower presence among Canadian journals, are competitors for many national scholar-led journals (Lange & Severson, 2021). French-language publishing also has to compete with English, which is not only a national language, but also the international language of science. Still in Canada, the relative growth of English in scholarly publishing has been affecting French-language publishing in most fields for multiple decades, except in the Arts and Humanities, for which the decline has been more recent (Larivière, 2018). Finally, national journals are often underrepresented in the traditional bibliometric databases, such as Web of Science and Scopus, both at journal and article level, quantitatively as well as qualitatively (Basson et al., 2022; Larivière, 2018). As a result, the value of these journals tends to be underestimated, or is simply not accounted for, in research evaluation.

Due to the highly dynamic nature of scholarly publishing, the total volume of Canadian journals is difficult to establish, and estimations may vary according to the sources; however, several efforts have been made. In the early 2000s, in a context of transition to online publishing and gradual adoption of new digital technologies, Lorimer and Lindsay (2004) estimated around 150-200 active Humanities and Social Sciences journals in Canada. Years later, Paquin (2016) surveyed 337 Canadian journals, concluding 25% of journals had adopted OA, with modest annual revenues, ranging between 30,000 and 80,000 CA $. More recently, Larivière et al. (2021) collected data from Ulrich's Periodicals Directory and retained 825 active Canadian journals in 2019, of which almost three quarters published in the Humanities and Social Sciences (611 journals) and around a quarter in Science, Technology and Medicine (214 journals). Focusing on independent journals, defined as those not affiliated with commercial publishers, Lange and Severson (2021) identified 485 Canadian scholarly publications across all subject areas.

Considering the various models for journal support, supporting actors and the rapidly evolving publishing practices and policies, an up-to-date characterization of the Canadian scholarly journal landscape may serve as a valuable tool to establish strategies for optimizing journal support, thus assisting universities, funders and infrastructures. It may also help journal editors in understanding their environment and identifying their journals' "niche". In contrast with previously mentioned studies, we adopted a historical perspective, identifying the journals' years of founding and cessation, which allowed for the detection of tendencies in the evolution of journal characteristics. This study also included original data on the access provided, and the languages used at the jour-

[1] We have searched online to recover past versions of the program. The earliest traces of this program date back to 1981: Rapport annuel 1981-1982 / FCAC, Fonds F.C.A.C. pour l'aide et le soutien à la recherche. Downloaded from https://numerique.banq.qc.ca/patrimoine/details/52327/4274170.

nal level. Focusing on the Canadian situation, we did not attempt to evaluate the domestic journal landscape through international comparisons.

Thus, the aim of this study is to characterize the Canadian scholarly periodical publishing landscape, based on an up-to-date list of Canadian scholarly journals. To this effect, journal types were not defined *a priori*, which means that various, sometimes overlapping, types of journals were included in the analyses, such as national, non-profit, commercial and student journals. This approach allowed us to describe and distinguish the various journal types actively being published from within Canada. Generally, we focused on the organizations behind the journals, the types of OA, disciplines, geographic origins, languages and dissemination platforms and tools.

Methods

Journal titles and their characteristics were compiled using a variety of sources. Four criteria were established for journals in order to be included in the analysis: 1) the journal should be scholarly, including peer- or editorial review, and periodical, thus excluding proceedings; 2) the journal should be mainly managed from within a Canada-based institution, association or society; 3) the journal should have an ISSN associated; 4) the journal should appear legitimate, i.e., journals should not be associated with publishers known to have "questionable" practices, yet we acknowledge this criterion is difficult to define and partly based on perceptions. We excluded a few well-documented publishers such as the Canadian Center of Science and Education and CSCanada, which figured in Beall's List, and which show multiple traits of predatory publishing. In addition, an open checklist published by the University of Toronto Libraries was used as guidance to identify questionable content for individual journals[2]. Although MDPI has traits of a questionable publisher, we decided to include their three Canadian journals, as, individually, these appeared legitimate. Student journals were also included in the analysis if they responded to these four criteria. The main input for journal titles and ISSN were the dataset created by Larivière et al. (2021), OpenAlex' Sources dataset (Priem et al., 2022), the open dataset published by Lange and Severson and updated in 2021 (Lange & Severson, 2019), CRKN's Open Access Journals List[3], as well as internal data from the Public Knowledge Project (PKP) and Érudit. Mir@bel[4] was used occasionally to add lacking information. After combining these datasets, duplicates were removed based on ISSN, with additional checking on the journal titles. The dataset is available on Dataverse (Van Bellen, 2024), as a snapshot published in March 2025.

A wide range of characteristics were documented. For each journal, the main organization managing the journal was identified and attributed to one of five groups. *Society* journals were defined as journals published by a clearly defined learned society or professional association. *Campus* journals were defined as journals that are primarily managed by a university department, a research institute, or a college. Journals managed by governmental departments and agencies, for example, Health Canada, were marked as *Governmental*. Some journals were linked to charitable organizations, alliances, interest groups or networks; these were merged into the group *Other*. Journals that could not be linked to any governing organization were marked as *Independent*. Library hosting was documented as a distinct trait, primarily because journals hosted by libraries can well be governed by societies or managed by university departments, although the latter is much more common.

Both active and ceased journals were included in the study. Journals were classified as ceased if no volume had been published since 2021. This rather generous delay was motivated by the fact that it is not uncommon for smaller journals to have a hiatus in their publishing record, especially in the context of the COVID-19 pandemic. We wanted to ensure these journals were not unjustly excluded from the analyses. While compiling the data, several journals were found to be part of a sequence. For example, the journal of the Mineralogical Association of Canada, today titled *Canadian journal of mineralogy and petrology*, was published as *Canadian Mineralogist* between 1957 and 2022, with both titles bearing different ISSNs. As both the organization managing and the scope of the journal remained unchanged, we considered these cases as representing a single periodical. This allowed for a more coherent analysis of historical trends in publishing.

Most fields of the dataset required additional resources to validate or to complete missing data. Library and Archives Canada's Aurora catalogue was used to obtain the years of creation and cessation (if applicable) of the journals and to validate the organization managing the journal. It was also valuable in obtaining information on journal sequences. The journals' accepted languages for submissions were documented based on existing datasets mentioned earlier, or they were identified on their respective websites. OpenAlex was used as the primary source for OA status, which relies in part on the Directory of Open Access Journals (DOAJ). However, we validated output manually as some information appeared inaccurate, possibly linked to imperfect detection or information not having been updated recently. Each journal was classified as Gold OA, Diamond OA, Hybrid, or Subscription, following the definitions by Piwowar et al. (2018)[5]. OA classification did not take account of the presence of licences;

[2] Available at https://onesearch.library.utoronto.ca/copyright/predatory-publishing

[3] Available at https://www.crkn-rcdr.ca/en/crkn-open-access-journals-list

[4] https://reseau-mirabel.info/

[5] For a discussion on the working definitions of OA, particularly, the Diamond OA category, see Simard et al. (2024).

mere access to read was sufficient to be considered as OA. Finally, journal websites were consulted to validate access types and to obtain journal policies relative to languages accepted. Internet Archive's Wayback Machine[6] proved helpful in retrieving language policies and other details of ceased journals. Each journal was manually classified as belonging to one of nine fields: Arts and Literature, Economics and Management, Health Sciences, Humanities, Natural Sciences, Professional Fields, Psychology, Social Sciences and Pluridisciplinary. These fields have been used by Larivière et al. (2021) and reflect the distribution of disciplines most common for Canadian journals. The Pluridisciplinary field was used for journals that accept submissions of any discipline.

Since many variables showed specific interrelationships, we performed multivariate analyses to identify the major patterns ("gradients") present within the journal ecosystem, based on a range of categorical variables (Table 1). Applied to the currently active journal dataset, the FactomineR package in R (Lê et al., 2008; R Core Team, 2022) was used for multiple correspondence analysis (MCA). Hierarchical cluster analysis was performed on the results of the MCA to identify clusters of similar journals. The Euclidean distance was used for calculating dissimilarities between observations. The final number of clusters identified was based on visual interpretation of the dendrogram, aiming to detect a natural division in the dataset while retaining a workable number of clusters.

Journal cessation dynamics were modelled by binary logistic regression, using journal cessation as a dichotomous, dependent variable, and multiple journal characteristics as independent variables. These analyses, performed using the stats package in R, allowed for the identification of the main variables that could be linked to journal cessation. Binary logistic regression thus allowed for an evaluation of simultaneous effects of different journal characteristics on cessation while taking account of potential confounding and interaction effects. The best model was selected based on the Akaike Information Criterion using a mixed, stepwise selection.

Results

General overview

A total of 1265 Canadian scholarly journals were identified, of which 943 appeared to be actively publishing. All provinces have a presence of active journals, but no journals were found to originate from the Northwest Territories or Nunavut (Table 2). There is a strong concentration of Canadian journal publishing in Ontario and Quebec, with 501 and 183 active journals, respectively. This speaks of a pattern of scientific, academic and editorial centres and peripheries within the country. Ontario, as the most populous province and seat of the federal government, is home to many learned societies and professional associations operating at the national level, in addition to the presence of older, established universities and research centres, well endowed with human and financial resources. The high publishing activity in Quebec is likely associated with the importance of French, and may have been further enhanced by FRQSC's journal support program; eligible journals must publish at least 50% of their articles in French.

The current Canadian journal landscape is dominated by the broad SSH and connected disciplines, which together account for 71% of the journals (Table 3). Health and Natural Sciences represent 15% and 10% of the journals, respectively, while 4% of the journals were classified as Pluridisciplinary.

The six major commercial publishers globally, which include RELX-Elsevier, Springer Nature, Wiley, MDPI, Taylor & Francis and Sage Publishing (Butler et al., 2023; Van Bellen et al., 2024), together account for 65 journals, or close to 7% of the active journals. Compared to other journals, these journals are often associated with the Natural Sciences, the Health Sciences and Economics and Management (Table 3).

Currently active scholarly periodicals are characterized by a high diversity in access types, infrastructures for management and dissemination and hosting organizations. MCA allowed for the identification of a main gradient in the data, opposing library-supported Diamond OA journals, which use OJS, and are associated with the Social Sciences, on one hand, and Gold OA and hybrid journals of the Health and Natural Sciences, typically published by learned societies and major commercial publishers, on the other (Figure 1). This main gradient also showed strong divergence according to the year of creation of the journal. Hierarchical clustering was used to create a typology of four groups of journals (Table 4). A Chi-square test showed that access type was the major variable characterizing the clusters ($p < 0.001$).

The first cluster, which consists of 402 journals, is characterized by Diamond OA journals, hosted by libraries and publishing in English. Many of these journals use OJS for management, dissemination or both. The vast majority of student journals are found in this cluster.

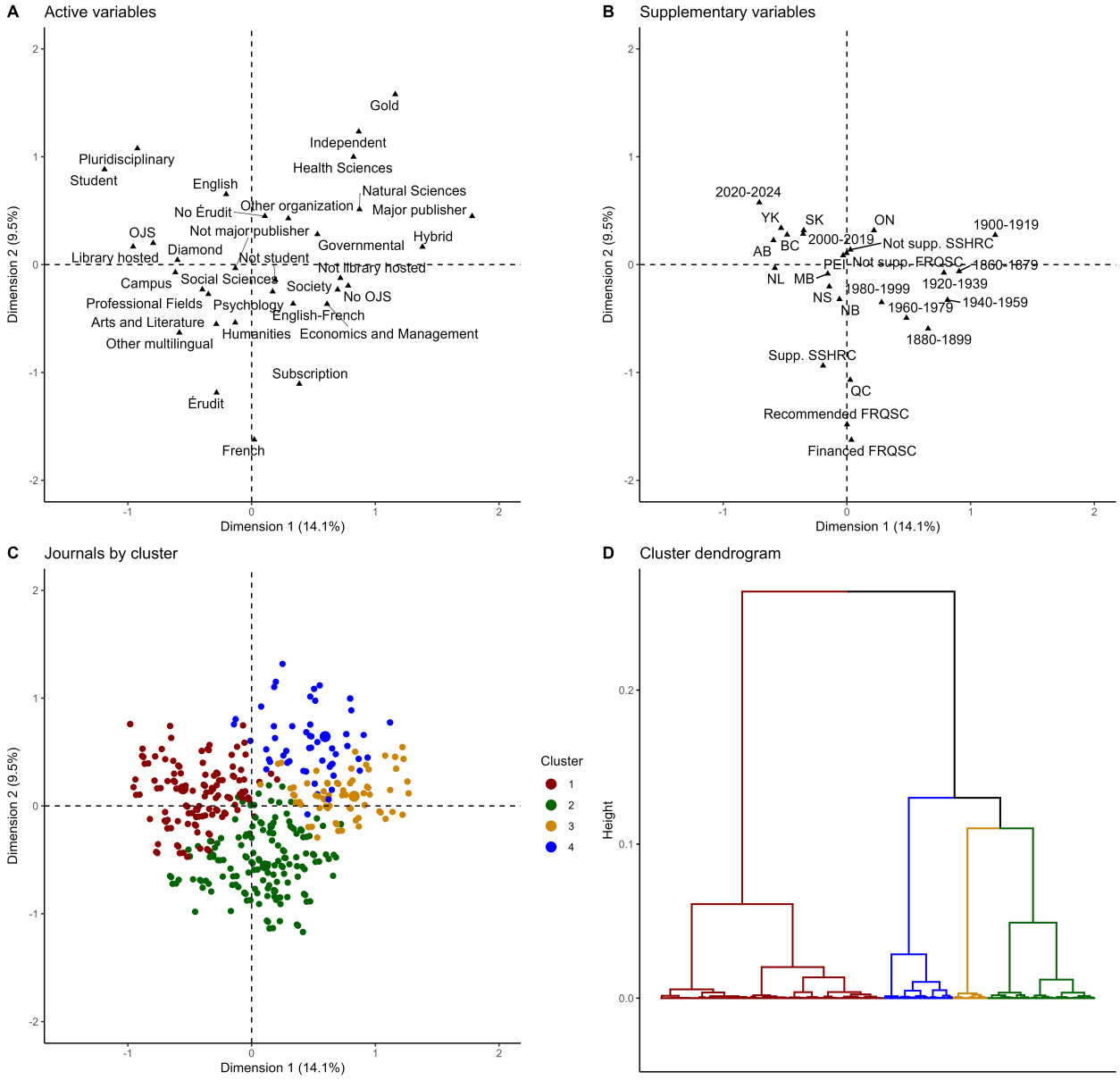
A second cluster of 275 journals typically includes French-language journals using a subscription model. These journals relatively rarely use OJS, but they are often disseminated on Érudit, with close to half of the journals being based in Quebec. Besides subscriptions, Diamond OA is relatively frequent among these journals. They are often associated with Arts and Literature, and the Humanities. Naturally, the vast majority of journals receiving support from FRQSC is present in cluster 2, yet this is also the case for most of SSHRC-supported journals.

The third cluster, representing 148 journals, is mainly composed of hybrid journals edited by learned societies, mostly active in the Natural Sciences. Journals of this group were

[6] https://web.archive.org/

Figure 1

Canadian journal landscape according to correspondence analysis of active variables.



Top left panel A shows linkages between active variables describing the journals. Top right panel B shows supplementary variables, which were excluded from the correspondence analysis, providing additional context to the pattern presented in the top left panel. The bottom left panel C shows the individual journals projected on the same space, according to the four identified clusters, following a hierarchical clustering on the principal components resulting from the correspondence analysis. The bottom right panel D displays the dendrogram resulting from the clustering.

Table 1

Journal characteristics included as variables for multivariate analyses. Only currently active journals were analyzed.

Journal characteristic	Description	Variable type in MCA
Access	Type of access	Active
OJS_usage	Journal uses OJS	Active
Language	Languages accepted for submissions	Active
Library	Journal is library-supported	Active
Organization	Type of organization managing the journal	Active
Student	Student journal	Active
Discipline	Discipline of the journal	Active
Érudit	Journal is disseminated on Érudit	Active
Major_publisher	Journal is published by one of the six major publishers	Active
Year_founded	Year (period) of journal creation	Supplementary
SSHRC_support	Journal has received recent SSHRC support	Supplementary
FRQSC_support	Journal has received recent FRQSC support	Supplementary
Province	Province of origin	Supplementary

Table 2

Active journals origin according to the province or territory.

Province/territory	n	%
Ontario	501	53
Quebec	183	19
Alberta	93	10
British Columbia	82	9
Nova Scotia	22	2
Manitoba	21	2
Newfoundland and Labrador	14	1
New Brunswick	13	1
Saskatchewan	11	1
Prince Edward Island	2	<1
Yukon	1	<1
Total	943	100

generally the longest running, with a median year of creation of 1972. This cluster includes the vast majority of journals associated with the six major publishers mentioned previously, but also most journals published by University of Toronto Press and Canadian Science Publishing.

Out of 79 Gold journals in the dataset, 71 are present in cluster 4. Being relatively young, they are typically not associated with a clearly defined organization. The 118 journals identified are almost exclusively in English and are primarily associated with the Health Sciences. The main publisher in this cluster is JMIR Publications.

Table 3

Active journals according to discipline and publisher.

	Total		Six major publishers	
Discipline	**N**	**%**	**N**	**%**
Social Sciences	220	23	14	22
Professional Fields	171	18	4	6
Health Sciences	145	15	18	28
Humanities	129	14	3	5
Natural Sciences	96	10	15	23
Arts and Literature	91	10	1	2
Pluridisciplinary	37	4	0	0
Economics and Management	28	3	8	12
Psychology	26	3	2	3
Total	943	100	65	100

Language

Today, the vast majority of journals either accept only English-language submissions, or English and French, especially in the Health and Natural Sciences (Figure 2). English-French bilingual journals[7], which are often managed by so-

[7]The fact that bi- or multilingual journals accept submissions and publish articles in different languages does not imply a balanced distribution of those languages. The figures for language distribution may be different if the analyses were conducted at the article level.

Table 4

Typology of active Canadian scholarly journals based on cluster analysis. Identified variables are meant to draw a general image of each cluster; clusters may show overlap according to some of the variables.

Cluster	Journals (n)	Dominant access type	Dominant language	Dominant organization type	OJS usage (%)	Dominant discipline	Year of creation (median)
1	402	Diamond	English	Campus	92	Social Sciences	2010
2	275	Subscription	French	Campus	23	Arts & Literature	1988
3	148	Hybrid	English-French	Society	5	Natural Sciences	1972
4	118	Gold	English	Independent	22	Health Sciences	2013

cieties, used to dominate until the early 2000s. The growth of journals managed on campus, which relatively often only allow submissions in English, has contributed to the current dominance of this language. Nevertheless, the growth of English-language journals appears to have somewhat stagnated over the last decade in SSH disciplines.

French-language journals have been more common in the broad SSH and associated disciplines, at least since the 1940s, compared to the Health and Natural Sciences. The share of these journals has remained relatively stable between 10% and 15%. In the Health and Natural Sciences, French-language journals have become rarer since the 1950s, currently accounting for 3% of the journals. Multilingual journals, defined as allowing languages other than English and French, show a slow but steady increase, today representing 5% of the journals in the broad SSH disciplines; yet only one such journal was found in the Health and Natural Sciences.

Access Models

The vast majority of Canadian journals active today have adopted OA, with Diamond OA by far the most common model, used by 61% of the journals. Gold OA is being used by 8%, while hybrid journals, which may provide access to a subset of their collection, represent 15% of the active periodicals. We found that 16% of the journals still demand a subscription to access parts or the entirety of their collection, yet some may allow for Green OA, i.e., they allow authors to make a version of the paper accessible through a repository.

Recently created Canadian journals have a strong penchant for Diamond OA, with Gold OA as a second option, as out of the 219 journals founded since 2015 (and still active today), 183, or 84%, use the Diamond OA model (Figure 3). Gold OA represents 16%, and a hybrid model has been adopted by one journal. Only 22% of the journals that currently offer Diamond or Gold OA were founded before 1995. Assuming that the general uptake of OA publishing started in the mid-1990s, we infer that close to a quarter of current OA journals active today were not created as such, but "flipped" to OA during the last decades. This proportion may be higher as some of the OA journals created after 1995 may have used a subscription model during their first years of activity. The vast majority of journals that currently use hybrid or subscription models were founded before 1995, at 90% and 81%, respectively (Figure 3). Based on these numbers, we may conclude that most of these journals started as subscription journals, with some switching to hybrid publishing along the way.

Of the active journals theoretically admissible for inclusion in DOAJ, i.e. active Diamond and Gold OA journals, 29% of the Diamond OA and 56% of the Gold OA journals are indeed indexed. Comparing the different organization types, journals not attached to a specific organization are most frequently indexed in DOAJ, at 52% of potentially admissible journals. OA journals managed on campus show the lowest level of indexing in DOAJ, at 28%. Overall, DOAJ indexing is particularly low among student OA journals, of which only 8% is indexed.

Historical Perspectives and Emerging Trends in Journal Creation and Cessation

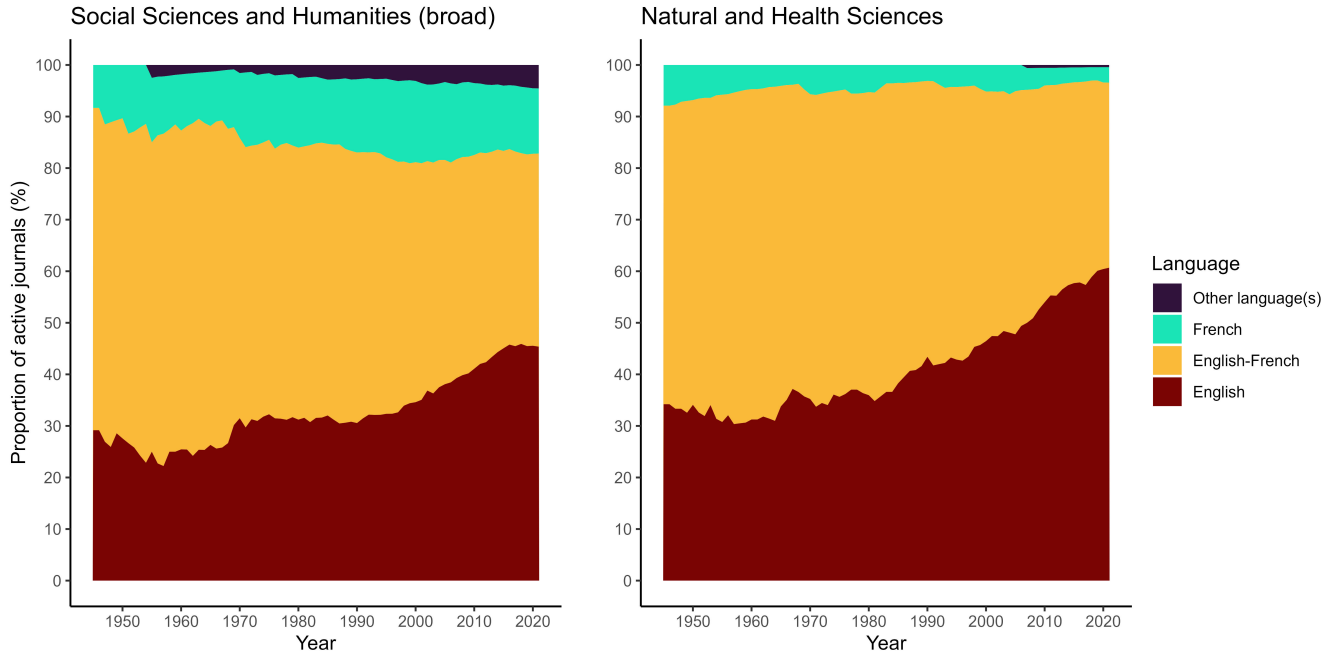
The number of active Canadian scholarly periodicals has increased from about a dozen in 1900 to more than 900 today (Figure 4). Whereas growth was limited until the 1950s, when close to a hundred journals were being published nationwide, many journals were founded during the 1960s and 1970s. Before this period the majority of journals were associated with the Health and Natural Sciences; the newly founded journals, however, were much more often associated with the Social Sciences, Humanities, Professional Fields and Arts and Literature.

During the 1980s, the creation of new journals slowed down and remained low until the early 2000s. Likely associated with the accessibility of online publishing, the number of journals founded increased rapidly in the new millennium, with 30 to 40 founded journals annually. However, the trend in new journals was mirrored by that of journals ceasing publication. During the most recent years, the number of ceasing journals equalizes the number of newly created ones, although there may be a delay effect for some very recently created journals that have not been included in our dataset.

Analyzing the entire dataset, i.e., covering more than 150

Figure 2

Proportions of active journals per year and per language in Social Sciences and Humanities disciplines (left panel) and in Health and Natural Sciences (right panel)



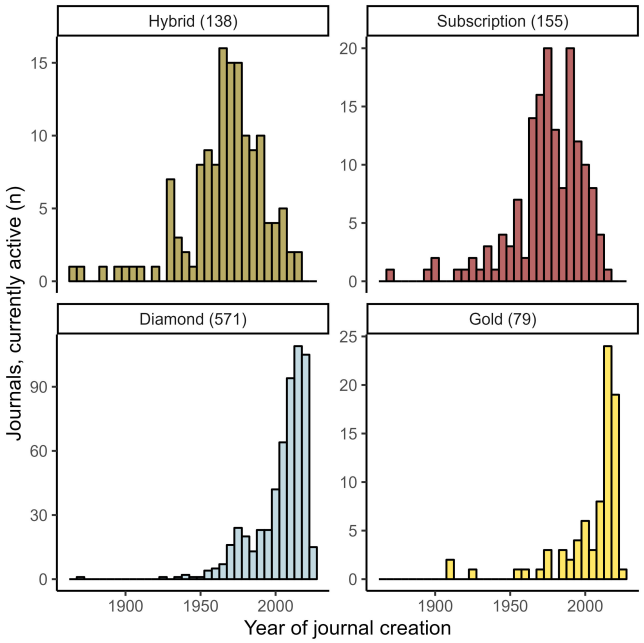
years, we found 322 periodicals having ceased publication, equivalent to 25% of the total number of journals having been active during this period. Focusing on journal cessation during the digital era, we applied binary logistic regression on a subset of 554 journals active in 2000, which may, or may not, have ceased publication since then. The final model, showing best performance based on the Akaike Information Criterion, included journal age as a major significant independent variable, having a positive effect on the journal's viability (Figure 5). The odds ratio of 0.98 implies the odds of cessation between 2000 and 2021 decreased by 2% for each year added to the journal's lifespan prior to 2000. According to the best model, journals managed by societies also stood a better chance of persistence: at an odds ratio of 0.49, they were about two times less likely to cease than journals managed on campus. On the other hand, student journals and journals published by a range of other organization types, often charitable organizations, alliances or networks, had significantly higher odds of cessation. All other factors being equal, student journals were 3.4 times more likely to cease activity compared to other journals. No significant associations between discipline, language or geographic origin and journal cessation were detected. Since accurate OA status data was not available for ceased journals, we could not evaluate journal cessation odds as a function of OA status. However, the fact that journal age is a main predictor for cessation suggests that journals using a Diamond OA model may be among the most vulnerable and they have likely been overrepresented among the ceased journals since the early 2000s.

Considering only the 619 journals founded between 2000 and 2021, we found 145, or 23% of these have ceased publication. This proportion is much higher than the 10% of journals active in 1980 that ceased publication during the following two decades, suggesting that journal viability has diminished markedly since the digital era. This decrease in viability explains partly why the median age of active journals has hardly changed since the mid 20th century. In 1950, the median journal age was 18 years, compared to 20 years in 2021 (Figure 6). The digital era has been particular in showing a divergence in journal sustainability and lifespan. While the 25% youngest journals have become progressively younger since the early 2000s, the 25% oldest journals have become older. These opposing trends show that, while older journals manage to consolidate their activity, younger journals are in a cycle of ongoing renewal, characterized by high cessation rates. This is confirmed by the median age of journals upon cessation for the 2000-2021 period, which was only 10 years.

Despite changing creation and cessation dynamics since the expansion of online publishing, the relative presence of the main types of organizations (i.e., campus and society associated journals) pursues a trend that was initiated more than fifty years ago. Universities have become the dominant entities managing journals at 54% of the active journals, while societies today account for 35% (Figure 7). The rise of univer-

Figure 3

Distributions of the year of journal creation, according to the current access type. Vertical scale varies per access type; total number of journals per access type is indicated in brackets.



sities as journal managing organizations may have been aided by the implication of librarians being involved in publishing. The proportion of journals published by universities and their departments that are also hosted by libraries is particularly high in Alberta, at 92%, and British Columbia, at 75%, yet this model is much less common in Quebec, at only 28% of the journals. An increasing proportion of journals are active independent of managing organizations. These independent journals current represent 9% of the active journals. The relative number of journals affiliated to government-related organizations has decreased during the digital era, accounting for just over 1% of the total (Figure 7).

Discussion

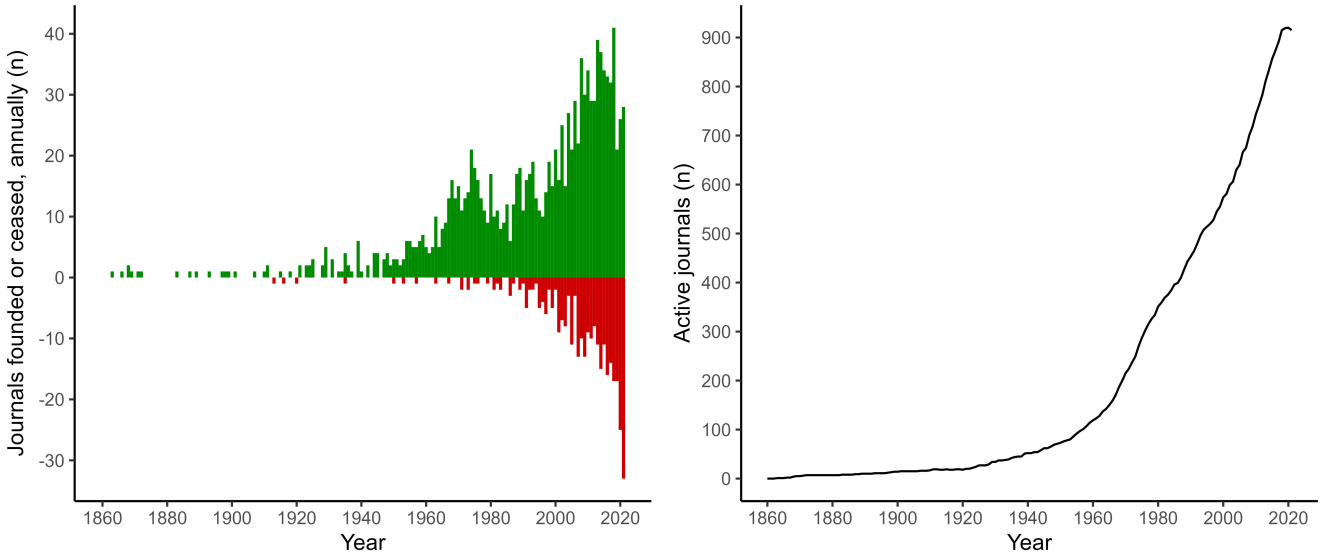
The results of this study are consistent with previous studies which have attempted to characterize the Canadian publishing landscape. Its main traits are the massive adoption of Diamond OA, the predominance of the SSH disciplines, and the scarce presence of the major commercial publishers. Canadian scholarly journals also present a great diversity in terms of the role of supporting organizations and publishers, language, and journal lifespan, which diverge along geographic gradients (Figure 1). Patterns related to journal origin can partly be explained by their linguistic context, but they may also reflect historical and cultural differences in the organization of scholarly publishing and the roles of the actors involved. Library support for journal publishing, for example, has become a standard practice for many Canadian universities (Whyte Appleby et al., 2018). Since equitable access to information is one of the core values of libraries, especially with regards to OA publishing and the persisting repercussions of the "serials crisis", it is not surprising librarians have been particularly active in supporting journals (Lippincott, 2017). Today, libraries are heavily involved in journal support in most of the provinces, particularly in Alberta and British Columbia, but much less so in Quebec. The development of library support for journals may have reinforced the use of OJS, and vice versa (Richard et al., 2009). Meanwhile, the more limited development of library publishing in Quebec may be linked to the creation of Érudit in 1998, and its mission of supporting journals, with almost 250 active journals disseminated at the end of 2024. It may also be associated with the particular role of librarians in Quebec, who, unlike their colleagues from the other provinces, often have a professional status rather than an academic one. As a result, Quebec librarians' roles may be described as being "supporting" and "administrative" and they are rarely actively involved in research (Zavala Mora et al., 2022). These librarians may thus be less connected to the publishing process in general and editorial support in particular. Finally, the financial and infrastructural support of FRQSC (and its ancestors) for Quebec journals may also explain why direct library support to journals has not been developed as much as elsewhere in Canada.

Open Access Mandates and Uptake

Both the current SSHRC Aid to Scholarly Journals program and the FRQSC *Soutien aux revues scientifiques* aim to support SSH journals that are entirely OA (thus excluding hybrid journals) or that have a 12-month maximum embargo to access. These embargo journals sell subscriptions for users to access the most recent content. In practice, both SSHRC and FRQSC programs particularly support journals using the latter model. Our data show that SSHRC provides funding for 29% of the Canadian subscription journals in SSH and 15% of Diamond OA journals of the same disciplines. In Quebec, FRQSC supports 7% of subscription journals (publishing in French, along with other languages or not), compared to 36% of Diamond OA journals. However, many subscription journals require a subscription for their entire collection, or they have embargo periods exceeding 12 months. This makes them ineligible for funding, which means the denominator in our calculation may be overestimated. In consequence, the success rates for subscription journals to obtain support are underestimated. These numbers suggest that a delayed-access subscription journal currently stands a better chance

Figure 4

Evolution of the Canadian journal landscape since the mid-19th century. The left panel shows the annual number of journals founded (green) or ceased (red). The right panel shows the number of active journals from 1860 to 2020.



of being funded than a Diamond OA journal. Nevertheless, a thorough evaluation of funding patterns should also include the characteristics of the journals having *submitted* a funding application.

Like FRQSC, the SSHRC program particularly supports OA and subscription journals from Quebec, in comparison with the other main provinces: 30% of Quebec SSH journals are effectively supported, compared to 15% for Ontario, 12% for British Columbia and 9% for Alberta. Again, it is not possible to identify any bias in the attribution of funding, because no (public) data on journals applying for SSHRC or FRQSC funding is available. Nevertheless, the current programs may fall short in their respective aims to encourage and promote the transition to OA models of publishing. As subscription models, with or without embargo, remain frequent in Quebec, in comparison with the other provinces (Table 4), we hypothesize that the past and current support programs may have contributed to journals consolidating embargos, rather than flipping to OA.

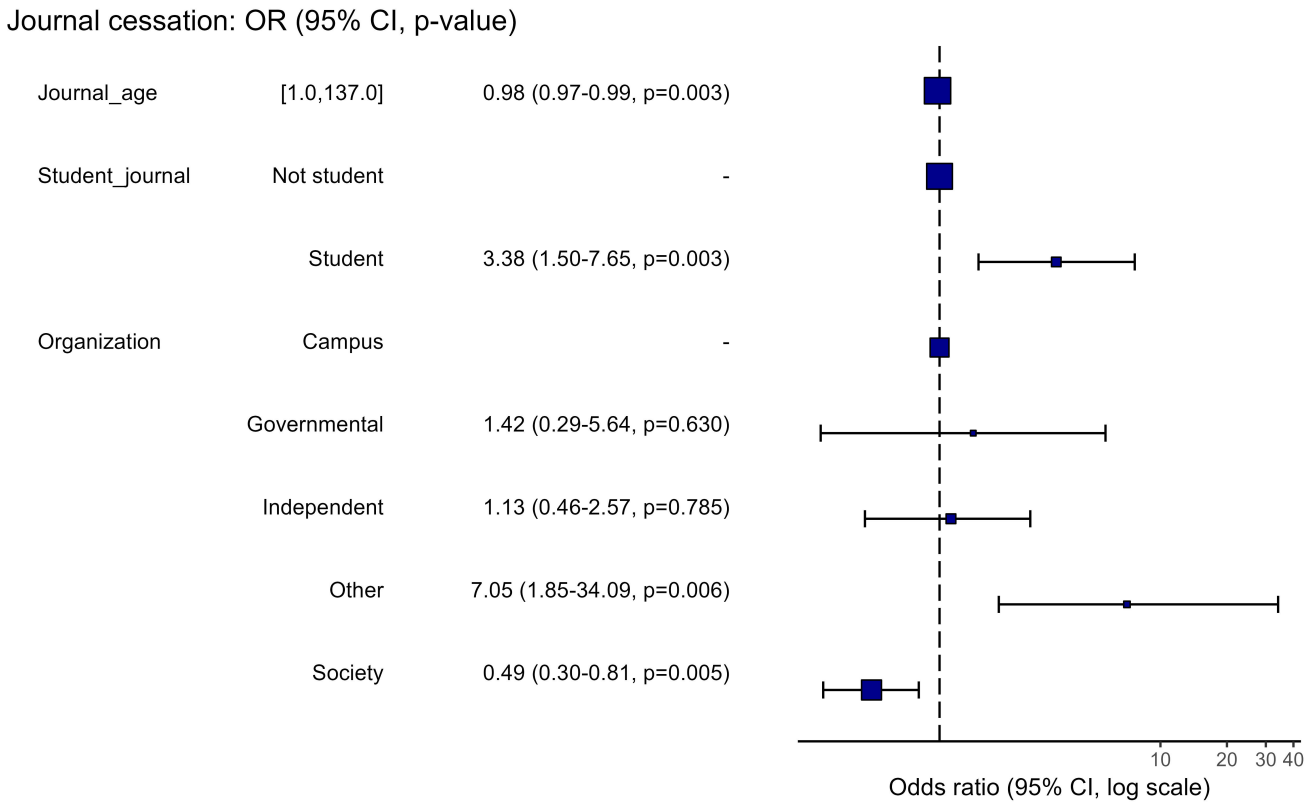
Journal Sustainability

We found that 26% of the Canadian scholarly journals active since the mid-19th century have ceased publication. This proportion is consistent with a 2017 report by the Canadian Scholarly Publishing Working Group, which estimated that around 20% of Canadian journals ever founded had ceased publication by that year (Canadian Scholarly Publishing Working Group, 2017). When comparing internationally, the cessation rates of Canadian independent OA journals may still be relatively low; focusing on 250 scholar-published, OA journals founded before 2002, Björk et al. (2016) found only just over half of these were still active in 2014.

The widespread adoption of online publishing has allowed for a greater potential for dissemination along with reduced expenses, and it has led to new journal management tools and publishing modes as reflected by various types of OA being adopted today. However, considering the sharp increase in journal cessation, achieving long-term sustainability appears challenging for many journals. This difficulty could be related to a lack of human resources, financial support, or submissions. While some journals may succeed in resorting to a wide range of funding sources, they most often rely on volunteer work, in-kind support from research performing organizations (mainly universities) and funds from government agencies (Bosman et al., 2021). The stability of society journals may be explained by a relative consolidation of editorial teams and a more stable financial framework, in addition to a readership that is partly composed of (paying) members. Likewise, the fact that older or established journals appear more viable may be related to their ability of maintaining human resources and financial support. Considering journal sustainability, we also suggest these journals benefit from a Matthew effect, whereby more established journals with experienced editorial boards are in a better position to successfully apply for funding. Both SSHRC and FRQSC programs, which have been in effect for more than 40 years, are likely to have had a stabilizing effect especially, on older, more established journals (Figure 1). All journals receiving FRQSC support, which has both a financial and an infrastruc-

Figure 5

Odds ratios and their confidence intervals for independent variables predicting journal cessation between 2000 and 2021, based on binary logistic regression. The first column shows the variables included in the final model and the second column either the range of values (for journal age) or the classes (for the other, qualitative variables). The third column contains the odds ratios, their confidence interval and the p-value. The blue squares represent odds ratios and their whiskers the 95% confidence interval.



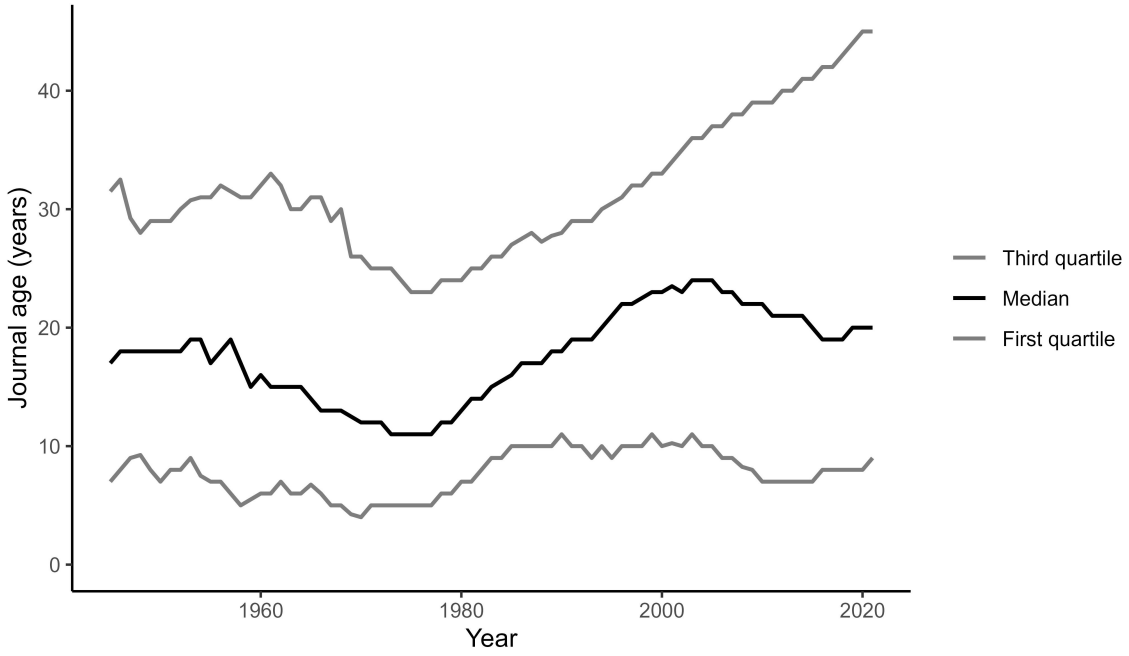
tural component, are disseminated on Érudit. Besides ensuring dissemination, Érudit actively supports journals through production services, documenting and registering metadata, optimizing discoverability and general advice on standards and best practices in scholarly publishing. Thereby, Érudit may act as a substitute to the publishing services provided by libraries to other journals. Finally, older journals may also be considered more prestigious, which may help sustain a flow of quality submissions and securing a readership.

Student journals, however, have limited access to these resources. Student journals are not eligible for government funding, nor can they benefit from Érudit's services. Ensuring a stable editorial team is a perpetual challenge for student journals, given the high mobility of students. The availability of OJS for journal management and dissemination has lowered the threshold for the creation of new journals (Björk et al., 2016), yet its convenience may well have had a downside concerning longevity, as many of these new journals may have been founded without much planning or perspectives for long-term support.

The state of scholarly publishing in French has been subject to many studies, which generally underline its fragility (Bégin-Caouette et al., 2024; Godin, 2002; Imbeau & Ouimet, 2012) or declining prevalence (Larivière, 2018; St-Onge et al., 2021). Canadian researchers working in a French context become increasingly inclined to publish in English, often in order to join international networks and to increase the impact of their research (Warren & Larivière, 2018). We show that, nationally, the share of French-language journals is declining in the Health and Natural Sciences, but also that a certain stability has been attained in the SSH (Figure 2). The policies and programs of the province of Quebec and other initiatives related to the revitalization of French as a language of science may be protecting this linguistic and academic niche from the centripetal forces that pressure scholars towards publishing "in high-profile centre journals instead of in their traditional local or regional outlets" (Bennett, 2014, p. 241). Canadian journals publishing in French may be

Figure 6

Evolution of the journal age distribution for active journals, as quantified by the median and first and third quartiles.



able to capitalize on their national focus through language, as they allow researchers to attain a readership that may be best addressed in French, particularly presenting research topics with a more specific cultural or geographic relevance (Larivière, 2018; Van Bellen & Larivière, 2024). On the other hand, Canadian non-profit English-language journals operate in an international market, where journals compete in highly unequal conditions to attract authors, accrue scientific and symbolic capital, and ensure financial resources for their stability. Unlike their French-language counterparts, these journals cannot exploit their linguistic particularity to effectively attain a national readership. It should be noted, however, that the proportion of English-language journals in Canada continues to increase slightly (Figure 2).

Future Research and Policy Perspectives

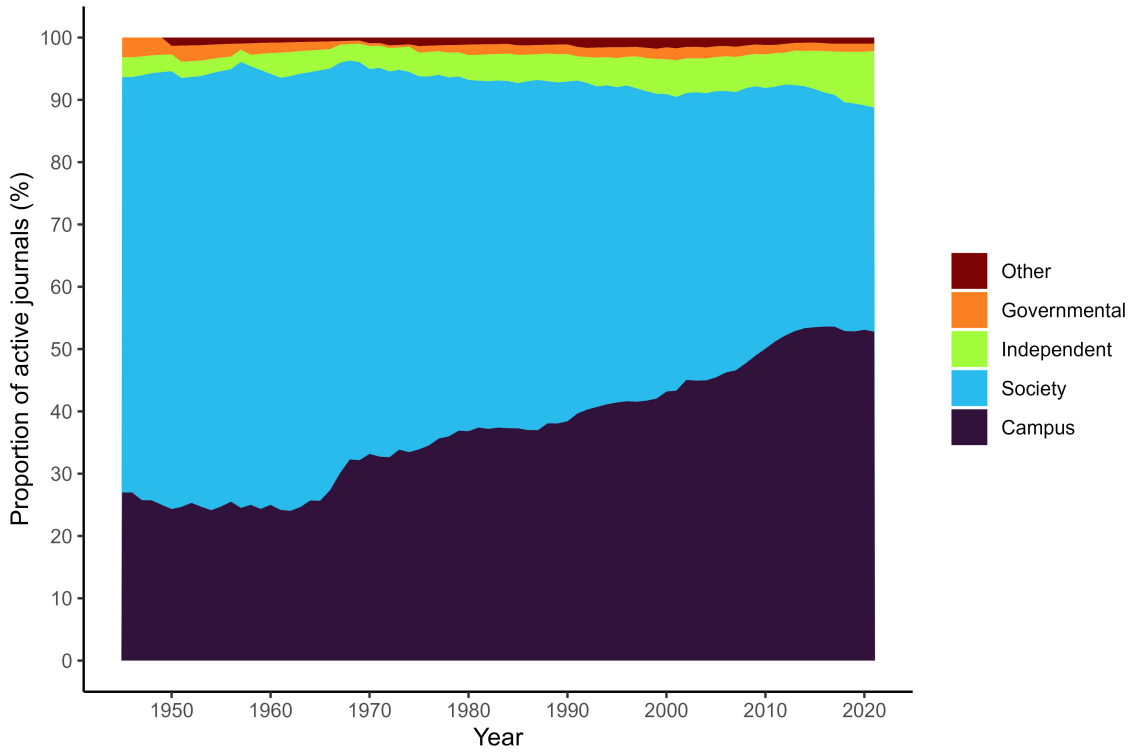
In the light of the non-negligible figures of inactive journals found in this work, more research is needed to better understand the factors that determine both the creation and the cessation of journal activities. The total number of active journals may still be on the rise (as shown by Figure 4) and journals ceasing activity is not a new phenomenon (Figure 6), but journal cessation has multiple downsides. These include the loss of editorial expertise and resources, and of publishing options for authors, who may, instead increase their use of international, commercial journals, or even questionable ones. It may also lead to vanishing scholarly content, especially for electronic journals lacking a long-term digital preservation policy (Laakso et al., 2021). However, at the macro level, a high rate of journal renewal may have a benefit, as innovation may be enhanced by the presence of many young entities. We call for a deeper understanding of the needs of journals with different profiles to provide them with more tailored support and thus ensure their economic sustainability and technical preservation in time.

In December 2023, Canada's three main federal research granting agencies (CIHR, NSERC and SSHRC) announced they would undertake a review of their OA policy for researchers. Once in effect, by the end of 2025, the *Tri-Agency Open Access (OA) Policy on Publications* aims to "ensure that all agency-funded, peer-reviewed research articles are immediately and freely available online to the research community, readers in the public, private and not-for-profit sectors, and the general public"[8]. Earlier, in 2021, the FRQ joined cOAlition S, and globally aligned its policy with that of Plan S in 2022. Compared to its previous 2019 policy, it presents three main changes: "[supported researchers'] articles must

[8] According to the 'Draft, Revised Tri-Agency Open Access Policy on Publications' available at https://science.gc.ca/site/science/en/interagency-research-funding/policies-and-guidelines/open-access/draft-revised-tri-agency-open-access-policy-publications (consulted 2025-04-11).

Figure 7

Proportion of active journals per year and per type of organization.



be made OA immediately (rather than within a twelve-month timeframe), they must bear one of the two more open Creative Commons licences (CC-BY, CC-BY-ND, or equivalent), and hybrid OA articles fees are no longer grant-eligible expenses except under certain conditions" (Harris et al., 2024).

Currently, both SSHRC and FRQ are adapting their journal support programs. Requiring journals to adopt OA while excluding subscription (and hybrid) models should favour Diamond OA. Recently, FRQ have announced that supported journals will be required to apply to be indexed in DOAJ. To what extent the reviewed mandates will lead to changes in the group of supported journals remains difficult to predict, as, besides the compliance to requirements, both the urgency of obtaining financial support and the readiness to apply will influence the ultimate pool of candidates. It will also depend on the ease of (currently supported) subscription journals to transition to a compliant OA model. As noted earlier, our analyses show that almost a quarter of active OA journals have flipped from a subscription model, in line with a previous estimate specifically for library-hosted journals of 16% (Willinsky, 2017); these numbers suggest this is not a marginal pathway to OA. The effects of the new OA policies on researchers' publishing practices and journals' economic planning would need a critical assessment in the future, also because compliance to researcher mandates has been lower in Canada than the United States and many European countries (Robinson-Garcia et al., 2020; Simard et al., 2022).

Limitations

This study encountered a few limitations, mainly considering the dataset at its origin. The first one was related to the identification of changes through time. Even though it was relatively straightforward to identify the year a journal was founded, it was highly complex, sometimes impossible, to identify changes in journal characteristics throughout its history. We used Library and Archives Canada's Aurora catalogue as a main source for information on journals, but its records do not allow to recover any changes in the publishing organization or language policies. Any detailed historic information had to be recovered from journal websites, but in many cases, details were difficult to find or absent. Likewise, due to time and resource constraints, it was not possible to establish the years journals joined commercial publishers, or the years journals switched access modes. Data on journals changing titles and ISSN, thus creating the aforementioned "sequences", could not be properly documented in the pro-

cess as time and resources were lacking to maintain updated versions of such parallel datasets.

The definition and the identification of the origin of a journal is debatable and may change throughout its history. We encountered a few journals which used to be published by a Canadian society, before joining an international partner organization and losing their Canadian scope. Such journals were omitted from the study. Finally, the existence of a range of questionable publishing practices complicated qualifying individual journals as "predatory" or even "questionable". Therefore, we acknowledge the final dataset has an element of subjectivity.

The interest in documenting patterns in Canadian scholarly journal characteristics lies partly in the role of these journals for national dissemination of knowledge. Naturally, some journals in our dataset play a much greater role in this respect than others and a few journals are likely weakly embedded in Canadian research networks. Accurately defining the degree of "nationality" of a journal ideally requires analyzing author- or article-level data. These types of analyses were not feasible in the context of this work, yet the availability of a domestic journal dataset is a requirement for exploring article metadata in detail, which opens the door to future research.

Conclusion

The different journal profiles identified in this study speak of a highly diversified landscape across Canadian provinces, OA types, supporting organizations and languages. These journals support bibliodiversity in terms of their age, the diversity of the authors who publish in them, the research subjects they present, their publishing organizations and the languages used.

Journal publishing practices have evolved over time, with clear transformations over the last decades since the advent of digitalization. Considering our data, we argue that online publishing has markedly changed journal management, production and dissemination, aided by open tools and platforms. In Canada, the development of OJS, the role of library support and the creation of Érudit have proven effective in maintaining a diversified national publishing landscape. Diamond OA has been adopted by 61% of the active journals, and 84% of the domestic journals founded during the last decade are using this model today.

Nevertheless, journal cessation has been a growing issue since the start of the digital era, and it is more common among younger journals. Resources for starting journals may be inadequate, especially regarding the stability of staff and financial support. However, as many journals cease publication within a few years following creation, we also suspect a more critical evaluation of the minimal requirements for founding a journal would lead to a higher proportion of successful launches. To this effect, starting journal editors would require a long-term perspective for support, allowing them to enhance their level of indexing to ensure discoverability, to become compliant with the SSHRC and FRQ funding programs and to be integrated in DOAJ.

The current beneficiaries from government funding programs, whether at federal or provincial level, have a rather specific profile, which corresponds to that of the journals which were grouped in cluster 2. This study provides insights for the design of more tailored policies that cater to the needs of under-resourced periodical types, and that take account of evolving practices among the entirety of the Canadian scholarly journals.

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