

Trends in interlibrary lending: a longitudinal data analysis on article sharing in Italy

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Abstract:

Interlibrary loan (ILL) article sharing data among member libraries within the Italian Network for Inter-Library Document Exchange (NILDE) for 2005-2009 and 2011-2015 have been collected. NILDE is the largest ILL network in Italy with almost a thousand libraries consisting mainly of university libraries, as well as libraries in hospitals and health research institutions, public research institutions, and not-for-profit organisations.

ILL request data collected from the NILDE system are analyzed. The present study replicates the methodology and data analysis of the authors' previous work for 2005-2009, with the aim of monitoring the changes which have taken place in article sharing over the past eleven years within Italy.

Results show an overall steady growth in the number of ILL article requests peaking in 2014, notwithstanding the widespread introduction of Big Deal subscriptions from the early 2000s and e-journal subscription growth across academic, research and hospital libraries, so that the increased availability of electronic resources did not seem to have led to a reduction in ILL requests. The longitudinal data analysis shows an annual rise in requests for newer articles, suggesting an increasing demand for recently published documents.

An initial inversion of this trend, starting in 2015, was observed, although not homogeneous per library disciplinary field. Should this trend be confirmed for 2016, further analysis could focus on new habits in peer-to-peer resource sharing through social research networks such as Researchgate, Academia.edu or Open access availability of publications, i.e., users' unmediated document retrieval.

Keywords: interlending, interlibrary loan, resource sharing, document delivery, academic libraries

Introduction

NILDE (Network for Inter-Library Document Exchange) is the largest Interlibrary loan (ILL) network in Italy with almost a thousand libraries consisting mainly of university libraries, as well as libraries in hospitals and health research institutions, public research institutions, and not-for-profit organisations. ILL data among NILDE member libraries for 2005-2009 and 2011-2015 have been collected and analyzed with the aim of monitoring the changes which have taken place in article sharing over the past eleven years within Italy.

The present study replicates the methodology and data analysis of the authors' previous work for 2005-2009 (Bernardini and Mangiaracina, 2011). The work analyzed the relationship between ILL and journal subscriptions, in both directions: if ILL services affect journal subscriptions and, vice versa, if electronic journal subscriptions affect ILL. The study presented a quantitative and qualitative analysis of journal titles shared by Italian libraries through their ILL services and confirmed previous well-established literature findings that ILL is not used by libraries as a surrogate for journal subscriptions. The most requested journals were identified and analyzed for trends by subject and publisher, and for any significant correlation between either Impact Factors (IFs) or citation counts and ILL requests. No correlation was found between journal IFs and ILL requests, but there was a statistically significant correlation between citation counts and ILL requests. Moreover, in spite of the widespread availability of e-journals acquired through consortia purchasing in universities and research institutions, our previous study showed a steady growth and overall rise of ILL in Italy, and that the most recent publications were increasingly involved in document supply.

The present work analyzes ILL services in Italy over a longer period, since it has been possible to collect ILL data over a 10-year period. It aims to show and monitor the behaviour of libraries which continues to respect copyright guidelines and licenses of use of electronic subscriptions, so that the ILL service is not a potential threat to publishers. On the other hand, the present work aims to verify the trends which the authors observed over the previous period, in order to confirm the trends, and to formulate hypotheses to provide insight into them.

Methodology

Data on fulfilled and not fulfilled ILL requests, from 2005 to 2009 and from 2011 to 2015, were extracted from the NILDE online database and stored in a local “warehouse”: a MySQL database called Whnilde. Library identities in the Whnilde database are anonymous.

Total fulfilled requests within the 2005-2009 five-years period were 491,414.

Total fulfilled requests within the 2011-2015 five-years period were 929,417 (almost double). Unfortunately, bibliographic metadata associated with ILL transactions, particularly journal titles, are neither complete nor available in a standard format. Total fulfilled requests of journal titles within the 2011-2015 five-year period were 876,752 and referred to 64,321 apparently unique titles. Actually, many titles appeared in different versions and it was necessary to identify each unique title for statistical analysis. Table 1 is an example of the diversity of the title versions encountered. Heterogeneity has several causes, as the request form can be completed in many different ways. Even a blank space could cause a duplication of the same title. Variations may occur due to: requests originating from catalogues using different rules for title cataloguing; references derived via Open URL-compliant NILDE

software from databases (i.e., Pubmed, ISI Web of Science, Scifinder..) using different standards for titles; manual input with spelling mistakes or non-standard title abbreviations.

J Alzheimer' s Dis.
J Alzheimers Dis
J Alzheimers Dis.
JoJournal of Alzheimer's disease
Jornal of Alzheimer's Disease
Journa of Alzheimer's Disease
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Journal of Alzheimer
Journal of Alzheimer Disease
Journal of Alzheimer's Disease
Journal of Alzheimers Disase
Journal of Alzheimers Disease
Journal of Alzheimer's disease
Journal of Alzheimer's disease (Online)
Journal of Alzheimer's disease (Online)
Journal of Alzheimer's disease : JAD

Table 1. Example of title variety: at the beginning of the analysis the title “Journal of Alzheimer’s disease” appeared in 18 different versions

The new version (after 2011) of the NILDE software supports librarians in the automatic detecting and capturing of the ISSN within the borrowing request from the Italian Serials Union Catalogue (Mangiaracina and Tugnoli, 2012). This allowed, for the list of 872,852 requests, 95.2% of them to be directly associated with the journal ISSN, corresponding to 40,895 unique ISSNs. Since multiple ISSNs could be referred to different formats of the same title, a converting table was used to associate the ISSN to its corresponding ISSN-L identifier (Abrahamse and Parks, 2010), allowing us to find 31,629 unique titles. The remaining 4.8% of requests were analyzed manually for identification: for many of them the ISSN and ISSN-L corresponding to the journal title were found, but we also found several titles without ISSNs and some titles which have an ISSN that is not associated with an ISSN-L; in the former case, we used the identifier which characterizes the title in the Italian Serials Union Catalogue, in the latter, we used the ISSN.

The final number of unique journal titles was 31,997, a 34.4% increase with respect to the previous analysis 2005-2009 (23,810).

There were 52,665 fulfilled requests for monograph parts, which was less than 5.7% of all ILL transactions.

Results and discussion

Results from ILL article sharing among NILDE libraries, over the period 2005-2015, show a steady overall rise in ILL activities up to 2014 (see Table 2).

Table 2 shows the number of borrowing libraries, the total number of requests, fulfilled and unfulfilled, the average number of fulfilled requests per library and the number of journal titles used in each year of the study. All of them show an upward trend. This growth could also be explained by the net increase in the number of libraries joining the network. In fact, the NILDE network is continuously growing due to the large number of new libraries joining, even though some of them leave or merge with others. These elements of flexibility also suggest a more careful approach in evaluating the growth of ILL requests, since data sets may be affected by such a continuously changing framework. However, the 56% increase in the

average number of requests per library since 2005 (+14% since 2011) indicates a real increase in ILL activity across Italian libraries.

	Borrowing Libraries	Total requests	Fulfilled requests	Unfulfilled Requests	Average number of fulfilled requests/library	Fulfilled requests for book parts	Fulfilled requests for journal articles	Unique journal titles
2005	496	86,320	75,652	10,668	153		75,652	6,287
2006	520	100,643	87,846	12,797	169		87,846	6,962
2007	558	113,250	99,083	14,167	178		99,083	7,823
2008	602	121,212	106,908	14,304	178		106,908	7,960
2009	633	137,065	121,925	15,140	193		121,925	8,471
2011	720	*179,517	150,153	25,448	209	4,722	145,431	16,614
2012	767	*212,322	179,677	28,454	235	7,166	172,511	17,770
2013	811	*228,830	194,271	30,022	240	10,314	183,957	18,574
2014	841	*243,977	205,730	33,589	245	13,288	192,442	19,018
2015	842	*236,667	199,586	32,326	238	17,175	182,411	19,221

Table 2. Figures for borrowing libraries in the NILDE network

* in 2011-2015 “Total requests” account for “Fulfilled, Unfulfilled and Canceled requests”

To understand whether ILL growth may be attributed to some specific group of libraries, Figure 1 shows ILL requests for journals, grouped by the borrower’s disciplinary fields over the 2005-2009 and 2011-2015 five year-periods. It appears that Biomedicine dominates in terms of volume and, in the second 5-year period, is responsible for more than 51% of all transactions (53% in the previous 5-year period), followed by Science & Technology (S&T) libraries with 22% (33%), Multidisciplinary libraries with 11% (8%), Humanities libraries with 9% (3%) and Social Science libraries with 6% (3%).

An initial inversion in the growth trend was observed in 2015, although not homogeneous per library disciplinary field. While Multidisciplinary, Humanities and Social Science libraries continue to augment their requests, probably also because the rise in their number within the NILDE network, for the first time a decrease in the number of requests was registered in 2014 for S&T, and in 2015 for Biomedical libraries. Should this decrease continue in future years it would require further analysis, probably linked to new user habits and user unmediated document retrieval.

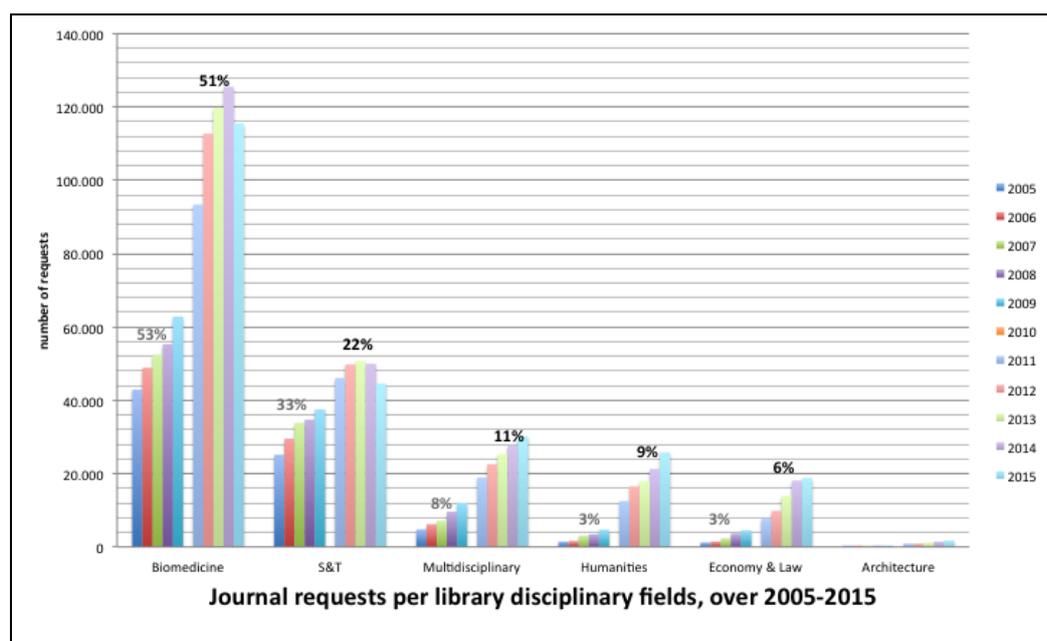


Figure 1. Journal fulfilled requests per library disciplinary field

Journal title use and age of publications involved in ILL has to be assessed in order to provide qualitative insights into library article sharing.

Table 2 shows a remarkable growth in unique journal titles year by year, including 2015 when ILL requests decreased; this fact suggests a greater diversification in end-user needs to support their research.

Figure 2 illustrates the distribution of title use over the five-year period 2011-2015 and demonstrates that requests were spread over many titles and only a small number were heavily used for ILL. This is in line with our previous findings on journal title use over the previous five-year period 2005-2009 (Bernardini and Mangiaracina, 2011). Within the 2011-2015 five-year period, 26% (8,248) of titles were requested only once by all the NILDE libraries; 55% (17,512) of titles were requested no more than five times, thus on average less than once a year; only 6% (1,882) of titles were requested more than 100 times, thus on average more than 20 times a year and they account for 61% (519,998) of all transactions.

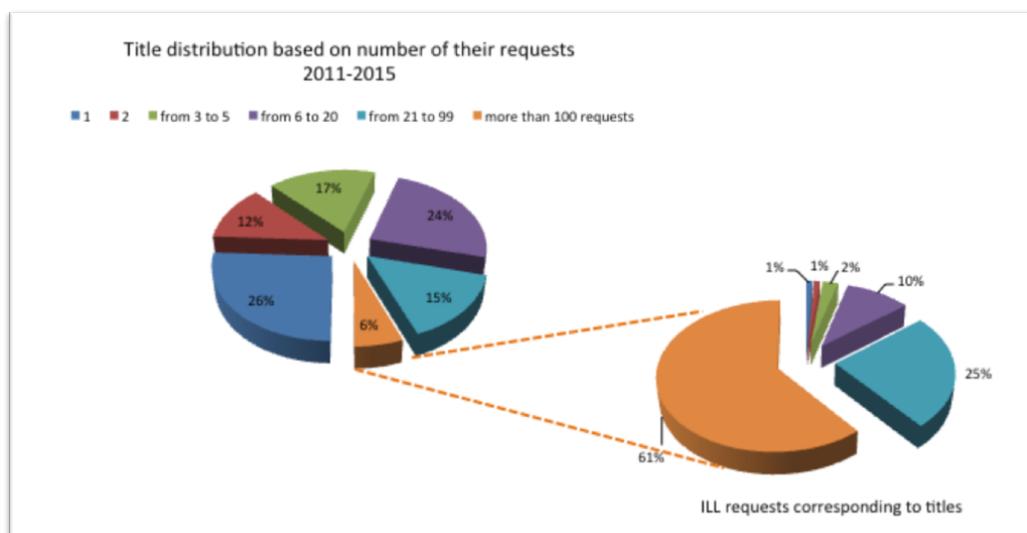


Figure 2. Journal title distribution and their corresponding ILL requests over the five year-period 2011-2015

Figure 3 shows request distribution by publication date over 2005-2009 and 2011-2015. We note that the graph curves for older documents are very similar and these results are consistent with previous studies (Bernardini and Mangiaracina, 2011). It is also remarkable how 1994 is clearly visible in all the curves as the watershed between pre- and post-Big Deals era.

Figure 3 also shows that the number of requests for articles published in the most recent years is steadily increasing year by year, demonstrating that researchers require an even higher proportion of the most recently published material than before. This trend was already observed in our previous paper (Bernardini and Mangiaracina, 2011), and is clearly confirmed during the overall period of the research. In fact, requests for articles published in the same year as the request rose from 11.9% (2005) to 14.9% (2009), and continued rising from 17.6% (2011) to 19.4% (2014).

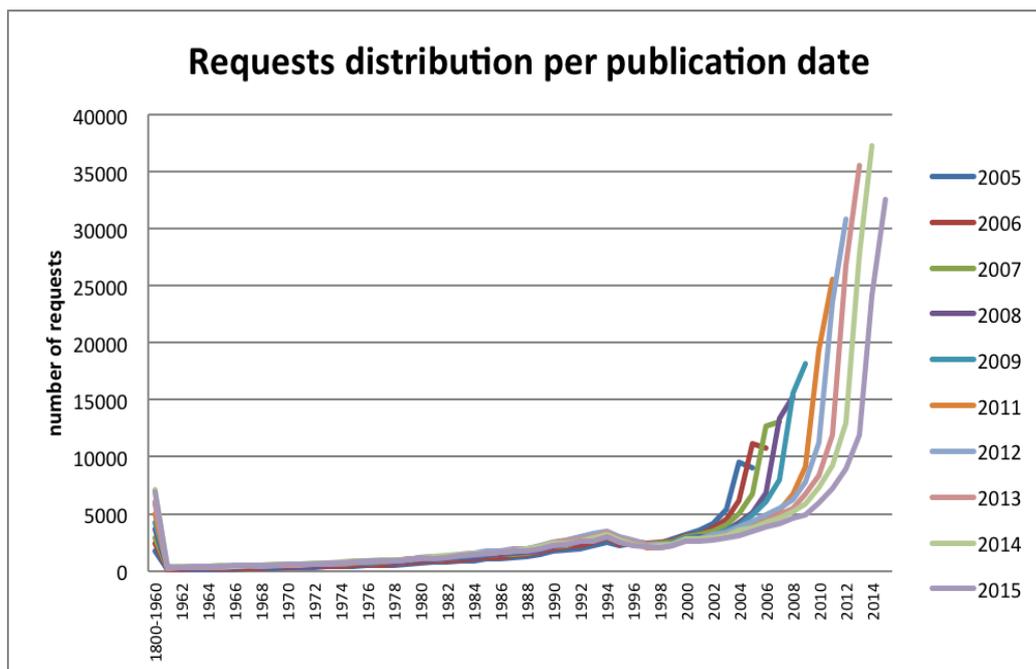


Figure 3. Requests distribution per publication date

The following part of the study focuses upon the most requested journals, through quantitative and qualitative analysis, in order to investigate what users mainly request and to monitor whether or not ILL services affect journal subscriptions.

From here onwards, we focus our analysis upon requests for articles published within the previous five years, for several reasons:

- more than 70% of requests come from Science, Technology and Medicine (STM) users, interested in reading and citing recent literature;
- older publications, at least in the STM subjects, do not affect decisions on subscriptions;
- the observed fact that over the last five-year period 2011-2015 studied requests for articles published over the previous five years account for 47% of the total number of requests.

Table 3 shows the number of unique journal titles borrowed more than 20 times per year and the corresponding number of fulfilled requests.

A small proportion (5-6% over the five-year period 2011-2015) of the journals are responsible for a much higher proportion (29-33%) of all requests. Borrowing libraries made an average 1.8-1.9 requests for each title between 2011 and 2015 (2.0-2.2 between 2005 and 2009), and appear to distribute their requests better than before. Lending libraries delivered an average of 3.8-4.3 documents for each title (6.8-8.9 before). We note that lending libraries have been supplying less articles than in the previous study, and that the average ratio of borrowing libraries to lending libraries for each title is also decreasing. This means that the number of lending libraries has been increasing (at least, for these sets of titles). The authors believe that several factors may have influenced this: on one hand, the increase in the number of libraries belonging to the NILDE network, on the other, the increased availability of electronic serials, which have steadily been catalogued in the Italian Serials Union Catalogue (ACNP) by a growing number of Italian university libraries since 2010. Moreover, the new version (after 2011) of the NILDE software provides a ranking algorithm suggesting to borrowers the most suitable lender library to select, in terms of best work-load distribution over the entire

network of libraries (Mangiaracina and Tugnoli, 2012). So, previously more rarely used libraries as lenders may have become more active on the lending side too.

	Titles requested \geq 20 times*	Total fulfilled requests corresponding to titles requested \geq 20 times**	Average borrowings/title by same library	Average lendings/title by same library	Average ratio between #borrowing and #lending libraries per title
2005	448 (7%)	15,247(20%)	2.0	6.8	2.9
2006	523 (8%)	18,541(21%)	2.0	7.1	3.8
2007	597 (8%)	22,308(23%)	2.1	8.3	4.5
2008	647 (8%)	25,942(24%)	2.1	8.7	4.6
2009	781 (9%)	33,524(27%)	2.2	8.9	4.5
2011	874 (5%)	41,449 (29%)	1.8	3.8	3.6
2012	1,009 (6%)	52,736 (31%)	1.9	4.3	3.8
2013	1,142 (6%)	60,629 (33%)	1.9	4.2	3.2
2014	1,148 (6%)	63,557 (33%)	1.8	4.0	3.2
2015	1,054 (5%)	54,387 (30%)	1.8	3.9	2.9

Table 3 Highly used titles (requested more than 20 times in a year), average borrowings per title

*In round brackets the percentage with respect to the total number of used titles

** In round brackets the percentage with respect to the total number of fulfilled requests

In this table only requests of articles published within the previous 5 years are taken into account.

The data observed over the overall period 2005-2015 confirm and strengthen our previous findings. In order to answer the question “is document supply used as an alternative to subscription?”, it can be clearly seen that in the majority of cases, institutions are not borrowing the same title regularly, as shown by the stable, even decreasing, very low indicator “average borrowings per title by same library” in Table 3.

Thus, there is no concern for publishers about ILL services threatening subscription revenues. It is also true that without an ILL service, some published articles would never have been read by researchers of non-subscribing institutions. The dissemination of information, even through document supply, is necessary for increasing the citation rate and other bibliometric indicators. Publishers benefit from a minimum level of ILL and they should support it rather than attempt to obstruct it.

It is worth considering that over the observed period, Italian public universities and research organizations, which are the backbone of the NILDE network, have suffered severe budget cuts, and subsequently, their libraries have also faced subscription problems.

We cannot exclude that some institutions in economic difficulties have given up subscribing to new titles or have even cancelled subscriptions to less frequently used resources, thus compensating for local needs through borrowing. The increase in ILL requests, combined with the increasing need for more recent publications observed for the first time in the 2005-2009 data, led the authors to initially hypothesize that this could be the first visible effect of the economic crisis (Bernardini and Mangiaracina, 2011). Nevertheless, the present analysis for the overall period 2005-2015 definitely shows that libraries do not use ILL in order to substitute subscription cancellations. Thus, the emerging need for more recent publications cannot be related to journal cancellations in libraries; the reason should be searched for in other factors, such as the increased references findability and discoverability through databases and internet search engines.

In order to look into the nature of highly requested titles, titles requested more than 20 times in each year between 2011 and 2015 were identified and constitute a “Core” set of 576 journals (1.8 % of total titles). Over the previous five-year period between 2005 and 2009 the Core was 224 journals (1% of total titles).

Table 4 shows the top 20 titles in the 2011-2015 Core, their publisher and the number of times they were requested each year. Top 20 titles mainly belong to societies or publishers which have not adopted the Big Deal commercial policy, or those which are not included in the negotiated packages (for example, the Springer title *Methods in Molecular Biology*). We expect that the *Journal of Endocrinological Investigation* will be excluded from the Core, since it has recently been acquired by Springer and is now accessible to many Italian libraries. Publisher Taylor and Francis (T&F) is present in the top 20 list with 4 titles. It would be worth considering subscribing to a bundle of T&F titles on a national consortium agreement basis.

Journal title	Publisher*	2011 [§]	2012 [§]	2013 [§]	2014 [§]	2015 [§]
Methods in molecular biology	Springer	579	830	943	417	280
Current pharmaceutical design	Bentham	235	351	387	398	337
Journal of Alzheimer's disease	IOS Press	260	338	273	386	379
Current medicinal chemistry	Bentham	323	338	311	331	228
Clinical and experimental rheumatology	Pacini Editore SpA	197	253	272	394	349
Anticancer research	International Institute of Anticancer Research	174	263	310	358	358
Inflammatory bowel diseases	Lippincott Williams & Wilkins	154	220	371	343	302
Science translational medicine	American Association for the Advanc. of Science (AAAS)	122	274	318	278	310
Expert opinion on pharmacotherapy	T&F	239	272	282	277	208
Journal of clinical endocrinology and metabolism	The Endocrine Society	185	264	241	274	183
The Journal of maternal-fetal and neonatal medicine	T&F	97	128	301	335	264
The New England journal of medicine	Massachusetts Medical Society	154	215	245	296	201
Nature reviews. Neurology	Nature Publishing Group	127	218	235	242	265
Journal of clinical oncology	American Society of Clinical Oncology	205	201	197	225	224
Proceedings of the National Academy of Sciences of the United States of America	National Academy of Sciences	158	206	244	215	169
Clinical cancer research	American Association for Cancer Research	166	211	211	200	202
Leukemia & lymphoma	T&F	127	188	211	222	219
Cancer research	American Association for Cancer Research	204	229	214	176	133
Journal of endocrinological investigation	Springer	178	188	178	230	161
International journal of immunopathology and pharmacology	Sage	148	266	196	148	113
Current medical research and opinion	T&F	132	204	215	178	130
The Journal of Immunology	American Association of Immunologists	134	198	232	182	74

Table 4: Top 20 titles among Core journals.

* Data about publishers refer to the last upgrade of Ulrichsweb (ProQuest LLC), as retrieved on June 21st, 2016

[§]Fulfilled requests of articles published over the last five years.

The existence of a Core set of steadily requested journals demonstrates the importance of implementing a national resource sharing policy linked to the national acquisitions policy, already existing for universities (in fact, in Italy CARE-CRUI negotiates nationally with publishers).

Probably, given the large number of potential borrowers (in fact, NILDE counts more than 800 libraries, as shown in Table 2) the number of 20 requests per title per year is too low a threshold to enter into the Italian Core collection of the most requested titles.

As confirmation of what has been observed about the majority of requests coming from STM users, it is interesting to notice that 96% (89% biomedicine, 7% science and technology) of Core titles belongs, according to the DDC (Dewey Decimal classification), to the 500-600 classes. The remaining 4% of titles belong to all other disciplinary areas (Figure 4).

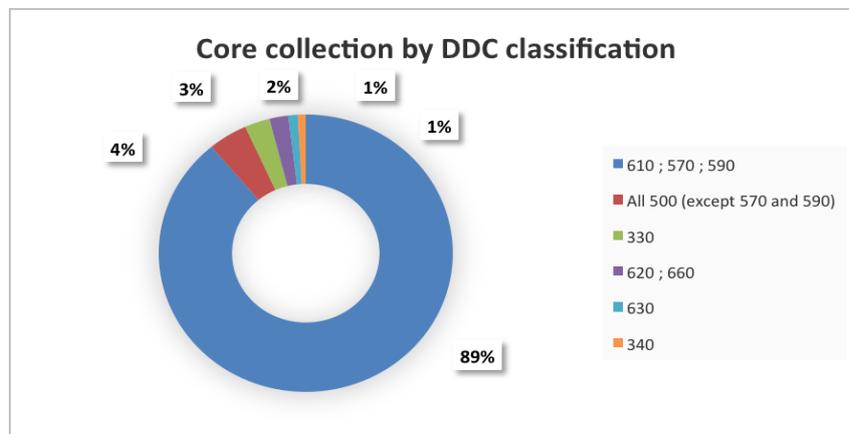


Figure 4. Core collection by DDC classification

Conclusion

Results from ILL article sharing among NILDE libraries, over the period 2005-2015, show a steady overall rise in ILL activities up to 2014 across Italian libraries. This is not surprising, given that, on the one hand, greater accessibility through Big Deals, digital conversion of back files and Open Access can lead to a decrease, whereas, on the other, increased findability and discoverability through databases and internet search engines, end-user population increase, changing behaviours and rising expectations due to ease of access to ILL services, improved turn-around time and the advent of an efficient cooperative network of libraries such as NILDE, all lead to increases in ILL requests.

An initial inversion in the growth trend was observed for 2015, although not homogeneous per library disciplinary field: a decrease in the number of requests was also registered in 2014 for S&T, and in 2015 for Biomedical libraries. Should this decrease continue in future years it will require further analysis, probably linked to new user habits and user unmediated document retrieval.

Requests are spread over many titles, and only a small number of titles are heavily used for ILL. A remarkable growth in unique journal titles used year by year, suggests a greater diversification in end-user needs to support their research.

The number of requests for articles published in more recent years is steadily increasing, demonstrating that researchers require an even higher proportion of the most recently published material than ever before. Such a need for these more recent publications cannot be related to journal cancellations in libraries; other factors are in play, such as the ease of information retrieval through web tools (databases, discovery, search engines, browsing through references and so on). Given the statistical correlation we found in our previous work (Bernardini and Mangiaracina, 2011) between citation counts and ILL requests of one and the same journal, on the basis of such preliminary results, it would seem that a faster availability of references to authors could explain the rise in ILL requests for more recent publications. Such a hypothesis requires further analysis.

Our results add to a well-established body of literature on the topic of ILL and journal subscriptions, confirming that library ILL services do not pose a threat to publishers.

The NILDE network appears to be a virtuous community: libraries request the same journal title on an occasional basis; thus publishers need not be concerned about ILL services threatening subscription revenues. Publishers are more likely to benefit from a minimum level of ILL and they should support it rather than attempt to obstruct it.

The NILDE network is an efficient and live community, as demonstrated by the steady increase in its member libraries and ILL requests. With an 86-89% fulfillment rate, libraries belonging to the network are able to satisfy more and more differentiated requests, as the growing number of unique titles/year shows. A greater diversification in the requested titles may make it even more difficult for a single library to choose their journal subscriptions. The authors believe that ILL data analysis should inform library acquisition policies. The present work will support the Italian library community in setting up an informed national resource-sharing and acquisition policy for universities and research organizations.

Acknowledgments

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