

Relationships Between Interlibrary Loan and Research Activity in Canada

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ABSTRACT

Interlibrary Loan borrowing rates in academic libraries are influenced by an array of factors. This article explores the relationship between interlibrary loan borrowing activity and research activity at 42 Canadian academic institutions. A significant positive correlation was found between interlibrary loan borrowing activity and measures of research activity. The degree of correlation observed depended on the category of institution, with undergraduate and comprehensive universities showing the largest correlations. This is the first study to quantify the relationship between interlibrary loan and research activity and the findings suggest that interlibrary loan plays a role in supporting academic research at Canadian universities.

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Interlibrary loan (ILL) borrowing activity at academic institutions is governed by a complex array of factors, some of which have been studied and documented in the literature. Correlations have been found between ILL borrowing activity and library collection size (both print and electronic), library budget, and institution size, but no study has looked at whether ILL activity is related to research activity. And yet, in the academic milieu, it is an underlying assumption that ILL borrowing requests are mainly for materials related to faculty or student research. For example, Collette Mak notes in her 2011 article discussing the rise in ILL activity at academic libraries in the United States: “Our ability to meet the research material needs of our faculty, graduate and undergraduate students allows them to see a direct connection between the service and their ability to research and publish.”ⁱ It is therefore worth investigating the assumed connection between ILL borrowing and research activity. The objective of this exploratory study is to determine whether correlations can be observed between ILL borrowing activity and measures of research activity at Canadian academic institutions.

Literature Review

Several studies have examined the links between library-controlled variables and both ILL borrowing and lending, but borrowing and lending activity can be influenced by very different factors, and thus only ILL borrowing (which is regarded as the more staff-intensive and costly of the two servicesⁱⁱ) will be examined here. Few very recent studies exist in this area and thus much of the literature reviewed here is from a time when ILL workflows were much less automated and placing an ILL request was much more time consuming for users. However, it is likely that correlations between factors such as library collection size and budgets and ILL borrowing activity found in older studies continue to hold true in today’s environment, and comparisons are made with more recent papers wherever possible.

One of the oldest studies to examine the relationship between library collection size and interlibrary loan borrowing rates found a negative correlation between the two – indicating that the larger a library’s holdings, the fewer ILL borrowing requests there were.ⁱⁱⁱ However, most researchers working on this topic found a positive correlation between library collections and ILL borrowing activity,

indicating that the larger a library's collection size, the higher their ILL borrowing activity, a correlation which is perhaps counter-intuitive. For example, one of the most recent studies to examine this issue was one that assessed 442 American academic libraries from 1997-2008 and found that the size of print monographic and journal collections showed significant positive correlations with the number of ILL borrowing requests filled.^{iv} An older study of 166 academic libraries in New York State during 1987-88 also found that the total number of volumes held by a library was positively correlated with the amount of ILL borrowing activity.^v The number of serial subscriptions, however, was found to be more weakly correlated with the number of ILL borrowing requests. Weak but significant positive correlations were also found between collection size and ILL borrowing activity in a five-year study of Association of Research Libraries (ARL) libraries.^{vi} A study done in primary access health-sciences related libraries also found a weak positive correlation between the number of serial subscriptions held by a library and the number of items borrowed on ILL.^{vii} A 1997 study in academic health sciences libraries found an effect of library size on this correlation – specifically, small health sciences libraries (less than 70,000 titles) showed a significant positive correlation between ILL borrowing activity and collection size, while larger libraries did not show this correlation.^{viii} In contrast, no clear correlation was found between collection size and status as a net borrower or lender at 85 small and medium sized academic libraries in New England in the late 1970's, but the 59 libraries who had larger collections (more than 300,000 volumes) were more likely to be net lenders.^{ix}

Fewer studies have assessed how library budgets relate to ILL borrowing activity, and the two that do exist contradict one another. A positive correlation between library expenditures and amount of ILL borrowing activity was found in a 1987-88 study of academic libraries in New York State,^x while a negative correlation between ILL borrowing and library expenditures was found in a 1974 study.^{xi} The authors were unable to find more recent studies looking at the link between library budgets and ILL borrowing activity.

Little work has been done to investigate the relationship between size of the primary client pool and ILL borrowing activity, but a 1997 study of academic health sciences libraries in which a size-

dependent correlation was seen; specifically, a positive correlation was found between size of the library's client pool and ILL borrowing activity for smaller libraries (less than 70,000 titles) , but no significant correlation was found between these variables for larger health sciences libraries.^{xii}

It is not clear how the increase in availability of online collections has affected ILL borrowing activity. A common opinion is that the parallel rise of discovery tools and full text content has meant that growth in ILL borrowing due to increased discovery capability provided by citation databases has outpaced any decreases in borrowing that might have occurred due to increased access to full text content.^{xiii, xiv, xv} Surprisingly, the most recent study on this topic found that the number of databases with at least some full-text content was positively correlated (though it was a weak correlation) with ILL borrowing activity.^{xvi} A study done at the University of Nevada from 1999-2003 found that the rate of ILL borrowing fluctuated – without a consistent decrease - despite the continued growth of full-text e-resources in the library's collection.^{xvii} According to statistics gathered for ARL research on ILL, the number of copies requested through ILL had increased from 1996-2002, just as many libraries were acquiring more full-text content.^{xviii} In a 10-year study conducted at a small liberal arts college, it was found that there was no overall decline of ILL article requests as the number of full-text journals grew. The author speculated that this may be due, in part, to “faculty researching obscure subject matter.”^{xix} There was found to be a nine percent increase in ILL of articles between 1995/96 and 1999/00 in 26 of Illinois' largest libraries, during which time access to online full-text journals increased significantly, and the authors speculated that access to online citation databases was part of the reason for the increase.^{xx} A study at a small private university underscored the important role played by databases in affecting ILL borrowing activity levels; the author determined that, from 1990-2000, an average of 63% of ILL article requests originated from databases, and that the number climbed significantly during the 10 year study- from 60% in 1990 to 80% in 2000.^{xxi} Not all research has shown ILL borrowing increases as a result of increased online content, however; decreases in document delivery were found in Spanish and French university libraries from 2000-2003, when full-text journal collections increased considerably.^{xxii} The purchase of new Elsevier e-journals was presumed to be responsible for a 22% decrease in ILL article

requests at the University of Glasgow Library between 1998-99 (prior to the Elsevier purchase) and 2001-2002, after the Elsevier package was purchased.^{xxiii} A significant decrease in the volume of ILL borrowing of photocopies was also found during a 10-year period in a college devoted to the study of criminal justice.^{xxiv}

Other studies suggest that the presence of OpenURL link resolvers has had an effect on ILL borrowing activity. This is probably for two reasons: first, OpenURL linking gives increased visibility to full-text resources, which may possibly lead scholars to further citation sources; second, many OpenURL systems, if they don't find a match for an article, will populate an ILL request form for the user.^{xxv} Jackson noted that "Several libraries report that requests from local patrons are increasing because of the seamless nature of transforming a citation into an ILL request."^{xxvi} Similarly, a majority of undergraduate ILL users were found to have placed their requests through OpenURL link resolvers at Minnesota State University, Mankato,^{xxvii} and a significant positive correlation between institutions that had link resolvers and ILL borrowing activity was found in a large-scale recent study of academic libraries.^{xxviii}

Mak found an increase of ILL activity among Association of Research Libraries institutions between 1974 and 2008, and she notes the importance of self-service, discovery, and integration for effective resource sharing: "while it would be easy to discount convenience as a driving factor, the integration of discovery and requesting allows the user to pursue their train of thought, largely uninterrupted by the request process."^{xxix} Jackson made a similar argument in 2004 when discussing the increase in article borrowing rates among academic libraries in the United States.^{xxx}

The issue of how ILL policies affect users' borrowing activity was explored in a 1993 study where faculty members and graduate students were surveyed about ordering a desired article on ILL. It was found that price was the most important consideration – more so than timeliness – in determining whether or not they would use their library's ILL service to obtain the article.^{xxxi} Another study found that cost was of very high importance to graduate students (less so for faculty) when deciding whether or not to place an ILL request.^{xxxii} A 2003 paper discussing the restructuring of Access Services at Ryerson University noted that, when the library dropped charges for ILL and increased promotion of the ILL

service, their ILL borrowing requests increased 110% in two years.^{xxxiii} All of these studies point to the potential importance of user cost in affecting ILL use, but other ILL policies such as ordering limits and eligibility of certain user groups for ILL service also likely impact borrowing use.

Several studies have suggested a connection between research activity and ILL borrowing rates, without actually studying the link overtly. One study reported that, when faculty were surveyed to see why they used ILL, 90% reported using ILL for their research.^{xxxiv} In a 2008 survey of 21 Jesuit institutions and private colleges in the northwestern United States that studied factors affecting borrowing levels, increased borrowing activity was partly attributed to the addition of new programs of study and increased graduate student enrollment.^{xxxv} The author also noted that “recent increases in the number of tenure track faculty had made significant contributions to the borrowing request numbers.”^{xxxvi} In another study, a surge of ILL borrowing activity was linked to “growth in students, faculty and research grant awards...many academic departments and individual faculty were involved in intensive research projects that required extensive materials on topic beyond the scope of collections.”^{xxxvii}

We have found only two studies in which the quantitative relationship between research activity and library activity was examined. In 1995, the number of publications produced between 1991 and 1993 by faculty at institutions belonging to the Association of Research Libraries (ARL) was examined in light of library factors. Although ILL activity was not examined, the author found significant positive correlations between the number of publications (and publications per capita) and total number of library volumes, total library expenditures, materials expenditures, as well as number of professional staff at the library.^{xxxviii} Another study examining the relationship between traditional ARL measures of library services (including the number of ILL transactions), expenditures and collections, found that these library measures were not reliable predictors of research influence or impact.^{xxxix} However, no study has specifically addressed the statistical correlation between the amount of ILL borrowing activity and research activity.

Resource Sharing in Canada

Canadian ILL and document delivery activity was studied at length and across all types of libraries in two large surveys; a study by Stuart-Stubbs et al., published in 1975, and a study prepared for the National Library of Canada by England and published in 1983. Both include extensive quantitative data on ILL activity in Canadian libraries. There have been no recent in-depth quantitative studies looking at ILL activity in Canadian academic libraries, although the Canadian Association of Research Libraries (CARL) does collect and report statistics on ILL activity each year in CARL libraries^{xi}. CARL describes itself as “the leadership organization for the Canadian research library community”^{xii} and represents 29 major academic libraries across Canada along with major government libraries such as the Canada Institute for Scientific and Technical Information (CISTI). And while it collects statistics on ILL activity at academic libraries across Canada, CARL does not act as a resource sharing consortium or create policies for resource sharing. Four Canadian regional academic library consortia are involved in resource sharing, however: the Council for Atlantic University Libraries (CAUL), the Conférence des recteurs et principaux des universités du Québec (CREPUQ), the Ontario Council of University Libraries (OCUL), and the Council of Prairie and Pacific University Libraries (COPPUL). These consortia are actively engaged in resource sharing issues and some manage consortia-wide ILL ordering systems. In 2007, this group of consortia instituted the COPPUL/OCUL/CAUL/CREPUQ Resource Sharing Agreement, which stipulates that members of these consortia lend books to each other for free and charge \$5.00 for articles.^{xiii} It is important to note, however, that libraries within these consortia have individual policies with regard to ILL user service policy issues such as charging and ordering limits.

Objective

Previous studies have looked at the relationship between various library attributes and ILL, but no study has examined the relationship between research and ILL activity. Our research question, then, is as follows: is there a relationship between ILL borrowing and research activity at Canadian academic institutions? We will study this by conducting bivariate correlation analysis of ILL borrowing statistics and research activity metrics for the years 2006-2009.

METHODS

Data used were for the years 2006/07, 2007/08 and 2008/09. Filled interlibrary loan (ILL) borrowing statistics for 63 Canadian university and college libraries were obtained from CARL, which collects data for CARL member libraries as well as non-CARL libraries in all provinces except Québec; specifically, CARL survey question number 4.3.3 “Requests sent to other institutions – Total filled” was used.^{xliii} This statistic normally also includes materials that were obtained through contract, for example with the Canada Institute for Scientific and Technical Information (CISTI).^{xliv} Although data are collected by CARL on the total number of ILL borrowing requests sent to other institutions, since a significant percentage of the requests may be cancelled, it was felt that using the filled statistic was more reflective of the actual need for items not held in the home library.

It is perhaps worth noting here that CARL does not, as part of its survey, offer a broad definition of ILL activity. Thus (as will be discussed later in the paper), different institutions may or may not include various types of resource sharing in their statistics to CARL. For example, libraries from different institutions that share a catalogue and allow users to order directly from their shared catalogue (as opposed to ILL software), may or may not include those transactions as ILL activity in the CARL statistics.

Although CARL collects statistics for 63 academic libraries in Canada, not all of them provided ILL borrowing numbers to CARL for the years in question, so only data from 42 institutions could be used. In addition, since the Conférence des recteurs et principaux des universités du Québec (CREPUQ) collects its own ILL statistics for academic libraries in Québec (which differ slightly from CARL’s ILL statistics), CARL ILL statistics were only available for the six CARL libraries in Québec, and of those six, only four had complete ILL statistics for the years in question, thus there are only four Québec libraries represented in the study out of a total of 18 CREPUQ members.

Total library materials expenditures budgets for the years in question were also obtained from CARL (Question 5.7).^{xlv} Institutional statistics - specifically, the number of full-time equivalent (FTE)

students and the number of full-time faculty - were obtained from Statistics Canada for the year 2007/08. Although enrollment and faculty complements vary slightly from year to year, it was felt that the variations were likely to be small.

For some parts of the analysis, the percentage of copies supplied was calculated using the CARL ILL filled borrowing statistics, which are broken down by originals supplied (Question 4.3.1) and copies supplied (Question 4.3.2).^{xlvi} The percentage of copies supplied is expressed relative to the total of copies supplied and originals supplied.

Research activity was quantified using both input and output measures. The input measure used was the amount of total funding (grants and scholarships) awarded to universities from the three major Canadian funding sources: the Canadian Institutes of Health Research (CIHR), the National Sciences and Engineering Research Council (NSERC), and the Social Sciences and Humanities Research Council (SSHRC). Research output was measured through the number of journal publications in the areas of health, sciences, and humanities/social sciences indexed by Thomson Reuters' Web of Science. As is typical for bibliometric studies, these numbers only include research articles, research notes and review articles, as they represent the peer-reviewed subset of the database.^{xlvii} Both the input and output measures included data for the universities themselves as well as their affiliated institutions (for example: hospitals and research centers).

Since previous studies had found that correlations of ILL activity with other factors sometimes varied according to institution size, academic institutions were grouped according to the categories assigned in the yearly Maclean's Magazine Canadian university rankings: "Primarily Undergraduate universities are largely focused on undergraduate education, with relatively few graduate programs; Comprehensive universities have a significant degree of research activity and a wide range of programs at the undergraduate and graduate levels, including professional degrees; Medical/Doctoral universities offer a broad range of Ph.D. programs and research; all institutions in this category have medical schools."^{xlviii}

A list of all institutions included in the study can be found in Table 1 (insert table 1). There were six institutions included in this study that are not included in the Maclean's ranking system but who are

academic institutions and thus members of one of the four Canadian consortia of university libraries (and so CARL collects their data). These institutions were categorized as “other” (the University of Ontario Institute of Technology was added to the Maclean’s rankings in 2009, the last year of this study, and so it was included in the “other” category for the purposes of this study). While the Maclean’s categories are not reflective of institution size but rather the institution’s focus, use of these categories may help shed light on the driving forces behind possible variations between groups.

The Spearman correlation coefficient was calculated using SPSS to determine relationships between the variables. This coefficient was used (as opposed to the Pearson correlation coefficient) because the data for all variables was not distributed normally, and there were also strong outliers in some of the data sets. Analyses were performed on the entire group of 42 institutions as well as within each of the Maclean’s categories of institution type (undergraduate, comprehensive, medical/doctoral). Correlation scores range from -1.0 (a perfect negative correlation, indicating that as one variable increases, the other decreases) to 1.0 (a perfect positive correlation, indicating that as one variable increases, the other also increases); correlations near 0 are weak while those near 1 (or -1) are strong. The significance of the correlation (p value) tells us that the possibility of a relationship occurring by chance is very slim and that there is a very good chance (at least 95% for significance level of 0.05 and 99% for significance level of 0.01) that there is a real relationship between the two variables in the population and that it is not just a coincidence in the sample.^{xlix}

RESULTS AND DISCUSSION

ILL Borrowing Activity

The mean number of filled ILL borrowing transactions per year for the period from 2006-2009 for the 42 Canadian academic libraries studied was 11,740. This is a large increase from 2,200, which was the average number of items borrowed by 88 university libraries in 1981;¹ the increase in size of post-secondary institutions is likely to be largely responsible for this increase. The number of requests is smaller than that found in Jackson’s 2002 study of 44 American academic libraries, where she found that

the mean number of filled borrowing requests was 17,967.ⁱⁱ Indeed, a report which surveyed 86 college and university libraries in the U.S. and Canada found that Canadian libraries had seen much smaller increases in overall ILL activity (borrowing and lending, returnables and non returnables) between 2005-08 compared to their US counterparts, with U.S. libraries demonstrating a mean increase in activity of 25% while Canadian libraries only saw a mean increase of 3.5%ⁱⁱⁱ. It is worthwhile noting, however, that only 8 of the 86 libraries surveyed were Canadian.

The mean number of filled ILL borrowing transactions per FTE student per year in this study was found to be 0.85 (unfortunately, the older Canadian studies do not give enrollment statistics so historic comparisons cannot easily be made). The mean number of filled ILL borrowing transactions per full-time faculty member per year was 19.1; this number is perhaps higher than expected but only full-time faculty members were counted in this ratio, and many universities also have a large percentage of part-time faculty. The mean percentage of copies borrowed relative to the total of copies and returnables is 41%. Copies made up 47% of items borrowed by Canadian Anglophone university libraries in 1973,ⁱⁱⁱ and 54% of materials borrowed in Jackson's 2002 study of American libraries.^{iv} It is perhaps not surprising that the percentage of copies here is lower, because statistics that differentiate ILL requests for returnables (generally books) from non-returnables (generally journal articles) suggest that ILL requests for the latter are declining^{iv} even while requests for returnables may be on the rise, although it should be noted that a longitudinal assessment of ILL borrowing trends is outside of the scope of this article.

A breakdown of descriptive statistics by Maclean's category of institution is given in Table 2 (insert Table 2) and a breakdown by consortium is given in Table 3 (insert Table 3). The mean percent of copies for the Council of Prairie and Pacific University Libraries (COPPUL) is higher than it is for the other three consortia. The reason for this is not clear, although it may relate to the fact that COPPUL also has the lowest average level of spending on serials (an average of 63% of the materials budget is spent on serials for COPPUL libraries from 2006-2009, as opposed to 70% averages for both the Council of Atlantic University Libraries and Conférence des recteurs et principaux des universités du Québec, and 69% for Ontario Council of University Libraries), but there was no significant correlation between

percent ILL copies supplied and the percentage of budget spent on serials, for either the whole group or by consortia. The fact that members of the COPPUL consortium charge each other slightly less per article (\$4 for articles up to 50 pages instead of \$5 as in other consortia) may contribute to their higher borrowing of articles. Another possibility is that COPPUL member libraries may have more user-friendly ILL policies (for example, while most institutions do not charge primary users for ILL of books and other returnable items, it is not uncommon for libraries to charge for articles and it may be that more COPPUL libraries offer article ILL services for free) compared to other consortia, although this was not examined.

Relationships of ILL Borrowing with Institutional Size and Library Materials Budget

Table 4 (insert table 4) indicates that significant positive correlations were found between interlibrary loan borrowing activity and measures of the size of the institution for the group of 42 institutions. A correlation of 0.717 ($p < 0.01$, $N = 42$) was found between interlibrary loan borrowing and the number of full-time equivalent students (includes undergraduate and graduate students), and a similarly strong correlation of 0.750 ($p < 0.01$, $N = 42$) was found between interlibrary loan borrowing and number of full-time faculty members. However, when examined at the level of Maclean's categories, these correlations were only significant for undergraduate institutions. For the undergraduate group, the correlation between ILL borrowing activity and number of full-time equivalent students was 0.944 ($p < 0.01$, $N = 12$), and the correlation with the number of full-time faculty was 0.874 ($p < 0.01$, $N = 12$). A similar result was found in Miller's 1997 study of academic health sciences libraries, in which there was a correlation of 0.454 between ILL borrowing and the number of primary clientele among smaller libraries (with less than 70,000 titles), and a much weaker correlation among the larger libraries ($r = 0.172$).

A strong positive correlation of 0.715 ($p < 0.01$, $N = 42$) was also found between ILL borrowing and library materials budgets. A negative correlation would imply that as library budgets increase, interlibrary loan borrowing decreases, however a positive correlation, as was found here, indicates that libraries with higher materials budgets also have a higher number of ILL borrowing transactions. Costello and Duffy found a similar correlation of 0.71 between these two factors.^{lvi} When examined at the level of

Maclean's category, however, the correlation between library materials budget and ILL borrowing activity was the strongest for undergraduate institutions (0.909, $p < 0.01$, $N = 12$) and the correlations were weaker and non-significant for the comprehensive, medical/doctoral and other institutions.

It may be that small undergraduate institutions with low budgets have not acquired a "critical mass" of discovery and/or link resolver tools that could contribute to increased ILL usage. Porat and Shoham found that Israeli colleges (which have similar student populations as Canadian undergraduate universities) with larger library collections did significantly more ILL borrowing than colleges with smaller collections and they suggest that these larger libraries offer more services, publicize ILL more and are more inclined to invest resources in the ILL unit.^{lvii}

Relationships Between ILL and Research Activity

Strong correlations were seen between ILL borrowing and input and output measures of research activity. There was a significant positive correlation between ILL borrowing transactions and total research funding ($r = 0.774$, $p < 0.01$, $N = 42$), as well as between ILL borrowing transactions and total publications ($r = 0.785$, $p < 0.01$, $N = 42$). This indicates that institutions with higher research activity – as measured by research funding and publications - also have higher ILL borrowing activity. This does not necessarily indicate that research activity directly causes ILL activity, because there could be some other factor that we cannot measure here that is actually causing both variables to change in a related fashion, but the data do suggest a link between research activity and ILL use.

Results of correlations performed by Maclean's category of institution (Table 5) (insert table 5) show significant correlations between ILL borrowing and measures of research activity for universities in the undergraduate and comprehensive categories. Universities in the two other categories (medical/doctoral and other) did not show significant correlations between ILL borrowing and the research activity measures. It is possible that there were no significant correlations for the medical/doctoral category because institutions in this category have extremely large and rich collections, in some cases among the most extensive collections in North America. Thus, although they have high

research activity, they may not have high ILL borrowing activity. As for the six institutions in the “other” category, these institutions tend to be much less research focused, with less ILL borrowing activity, and thus relationships between research and ILL activity may be less consistent in this group.

No correlation was seen between percent copies as a total of all ILL materials supplied (herein referred to as “percent copies”) and research measures for the group as a whole. However, significant negative correlations were seen for medical/doctoral institutions between total research funding and ILL percent copies borrowed (-0.726 , $p < 0.01$, $N = 15$) and total publications and ILL percent copies borrowed (-0.602 , $p < 0.05$, $N = 15$); significant correlations were not seen for other categories of institution. It is perhaps worth noting that no significant correlation was seen between percent copies and percent of materials budget spent on serials, for either the whole group or individual Maclean’s categories. Medical/doctoral institutions with very high research activity probably also have very rich serials collections, and thus there may be little need for articles to be ordered. In addition, studies on the information seeking behaviors of scientists indicate that researchers use a variety of ways to obtain journal articles, including personal subscriptions and obtaining copies from colleagues,^{lviii} behaviors which may be more common among well-connected and well-funded researchers in medical/doctoral institutions with large research grants. It should also be noted that this correlation is for a very small number of institutions, and thus a few institutions with high research activity and very rich collections that have low ILL percent copies activity could contribute to the negative correlation. Another factor that may contribute to this correlation is the significantly higher percent copies in COPPUL libraries compared to libraries in other consortia. For example, if COPPUL medical/doctoral libraries have consistently very high percent copies but comparatively low research activity, this could affect the correlation – it may be that there is some shared factor among COPPUL libraries that is affecting their percent copies values and thus the correlation. An examination of correlations between percent copies and research measures performed by consortia suggests that for most consortia there are positive correlations between percent copies and research activity, however, since the number of libraries in some consortia was quite low, the results of this analysis are not reported here.

Effects of Other Resource Sharing Initiatives

In looking at a scatter plot that shows the relationship between ILL borrowing activity and total research funding (Figure 1) (insert figure 1), it can be seen that, as research funding increases, increases in ILL borrowing tend to plateau at three year totals of 50,000-75,000. This trend was also seen with other research variables. It is interesting to ponder the reasons for this trend. For example, are most Canadian academic libraries set up to handle a certain volume of ILL borrowing, and, if that level is exceeded, does the service slow significantly, so that requests start to decrease until processing times – and request numbers - return to normal? Alternatively, it may be that the demand for ILL plateaus at this level. There are three outlier data points that deviate from this pattern, however, and that have exceptionally high ILL borrowing numbers – these institutions are the University of Waterloo, the University of Guelph, and Sir Wilfrid Laurier University. These three institutions comprise the Tri-University Group (TUG), three universities in southern Ontario who have a shared catalogue and where users from all three institutions can request items from each other's catalogues and requests are processed via circulation as opposed to ILL software. The three TUG libraries include transactions from the shared catalogue borrowing service in their CARL ILL borrowing statistics; this service has almost certainly had an impact on their statistics, and points to the potential of this kind of non-traditional ILL service to significantly increase resource sharing capabilities, perhaps because of their increased ease of use (patrons order right from the library catalogue) and due to the fact that they require less staff time to process.^{lix} Upon further investigation, the authors found several examples of libraries in this study who were part of similar shared-catalogue initiatives (for example NEOS in Alberta, Novanet in Nova Scotia and Library Express in Manitoba), but in contacting these libraries it was determined that their “non-traditional” interlibrary loan data was not reported in a consistent manner. More effort could be made to clearly and consistently define and count the different kinds of resource sharing activities that are occurring among Canadian academic libraries so as to obtain a better understanding of the trends in inter-library borrowing.

Limitations

This is the first exploratory study to show a link between measures of research activity and ILL borrowing activity among academic libraries. There are a relatively small number of Canadian academic libraries included here, and it would thus be fruitful to study a larger number of American academic libraries to allow for a more robust analysis and the opportunity to carry out multiple regression analysis to determine how multiple factors together influence ILL borrowing activity. For example, the relationship among library materials budgets, research activity and ILL could be more closely examined than it can be in this study, which relies on bivariate analysis. Caution would have to be used, however, to clearly define which ILL statistics should be used and to ensure consistency in reporting inter-library borrowing activity.

Not all measures of interlibrary borrowing activity were counted in this study. Resource sharing activity carried out as a result of shared catalogue ordering is also likely to play a significant role in the interlibrary loan picture and yet this activity may not be counted consistently. Other inter-library activity that takes places via research networks which may be difficult if not impossible to quantify by way of consistently collected national statistics is potentially also very significant.^{lx} There is also likely to be a significant amount of interlibrary activity carried out via non-traditional ILL means, for example, via direct reciprocal borrowing (in Canada, there is a Canadian University Reciprocal Borrowing Agreement which allows students and faculty from one academic institution to borrow materials in person from another academic institution), and this can greatly increase the amount of interlibrary borrowing activity among institutions located in large cities within a short walking distance of each other.

The measure of publications used in this study was the number of journal publications, and not monographs, and this is likely to underestimate research output in the humanities, especially.^{lxi} Moreover, the numbers of papers are mainly based on international journals and only include a small proportion of the local French-language journals, which are an important vehicle for diffusion of knowledge in the social sciences and humanities. This might, as a consequence, underestimate research activities of French-language universities.^{lxii}

Conclusion

There are many factors which affect interlibrary loan borrowing activity at academic institutions. This is the first study to show a quantitative relationship between measures of research activity and ILL borrowing activity in academic institutions. More specifically, we found significant relationships between interlibrary loan borrowing activity and measures of research activity at Canadian academic institutions. Relationships were strongest among comprehensive and undergraduate universities, suggesting that ILL plays a role in supporting research particularly at these categories of institutions. This result begins to confirm a fundamental assumption held by many working in ILL and in academic libraries in general: that ILL is used to support research activity on campus. Significant positive correlations were also seen between institution size, library budgets and ILL borrowing activity in undergraduate institutions. All results also point to the effect of the type of academic institution on correlations between factors involving ILL; analysis by category of institution seems to be a worthwhile endeavor for those seeking to learn more about factors affecting ILL borrowing activity. Finally, this study underscores the importance of clearly defining the different types of resource sharing statistics being gathered. More research is needed to see if these relationships hold true in larger samples, and to better understand the interactions between variables.

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Table 1: List of Universities Included in the Study, With Maclean's Category and Consortium

University Name	Consortium	Maclean's Category
Acadia University	CAUL	Undergraduate
Brandon University	COPPUL	Undergraduate
Brock University	OCUL	Undergraduate
Carleton University	OCUL	Comprehensive
Concordia University	CREPUQ	Comprehensive
Dalhousie University	CAUL	Medical/Doctoral
King's University College	COPPUL	Other
Lakehead University	OCUL	Undergraduate
Laurentian University	OCUL	Undergraduate
Laval University	CREPUQ	Medical/Doctoral
McGill University	CREPUQ	Medical/Doctoral
McMaster University	OCUL	Medical/Doctoral
Memorial University	CAUL	Medical/Doctoral
Mount Allison University	CAUL	Undergraduate
Mount Saint Vincent University	CAUL	Undergraduate
Nipissing University	OCUL	Undergraduate
Nova Scotia Agricultural College	CAUL	Other
Ontario College of Art and Design	OCUL	Other
Queen's University	OCUL	Medical/Doctoral
Royal Roads University	COPPUL	Other
Ryerson University	OCUL	Undergraduate
Saint Francis Xavier University	CAUL	Undergraduate

Université de Montréal	CREQUQ	Medical/Doctoral
University of Ottawa	OCUL	Medical/Doctoral
Université Sainte-Anne	CAUL	Other
University of Alberta	COPPUL	Medical/Doctoral
University of British Columbia	COPPUL	Medical/Doctoral
University of Calgary	COPPUL	Medical/Doctoral
University of Guelph	OCUL	Comprehensive
University of Lethbridge	COPPUL	Undergraduate
University of Manitoba	COPPUL	Medical/Doctoral
University of Ontario Institute of Technology	OCUL	Other
University of Regina	COPPUL	Comprehensive
University of Saskatchewan	COPPUL	Medical/Doctoral
University of Toronto	OCUL	Medical/Doctoral
University of Victoria	COPPUL	Comprehensive
University of Waterloo	OCUL	Comprehensive
University of Western Ontario	OCUL	Medical/Doctoral
University of Windsor	OCUL	Comprehensive
Wilfred Laurier University	OCUL	Undergraduate
York University	OCUL	Comprehensive

Table 2: Descriptive Statistics for Filled ILL Borrowing Transactions between 2006-2009, by Maclean's Category

Maclean's Category	Average # of Filled ILL Borrowing Transactions/year	Average # of Filled ILL Borrowing Transactions/year/FTE student	Average # of Filled ILL Borrowing Transactions/year/Full time faculty	Percent Copies
Undergraduate (N=12)	7,734	1.03	23.5	36%
Comprehensive (N=9)	19,896	.98	26.4	38%
Medical/Doctoral (N=15)	14,448	.58	14.3	54%
Other (N=6)	750	0.94	11.1	29%
All (N=42)	11,740	0.85	19.1	41%

Table 3: Descriptive Statistics for Filled ILL Borrowing Transactions between 2006-2009, by Consortium

Consortium	Average # of Filled ILL Borrowing Transactions/year	Percent Copies
CAUL	5132	39%
CREPUQ	11690	34%
OCUL	13695	33%
COPPUL	12825	65%

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Table 4: Spearman Correlations Between Institution Size, Library Budgets and ILL Borrowing

	All Institutions (N=42)	Undergraduate (N=12)	Comprehensive (N=9)	Medical/Doctoral (N=15)	Other (N=6)
# of FTE students	0.717**	0.944**	0.183	-0.021	0.143
# of Full Time Faculty Members	0.750**	0.874**	0.167	0.143	0.714
Library Budget	0.715**	0.909**	0.183	0.036	-0.143

**** p<0.01**

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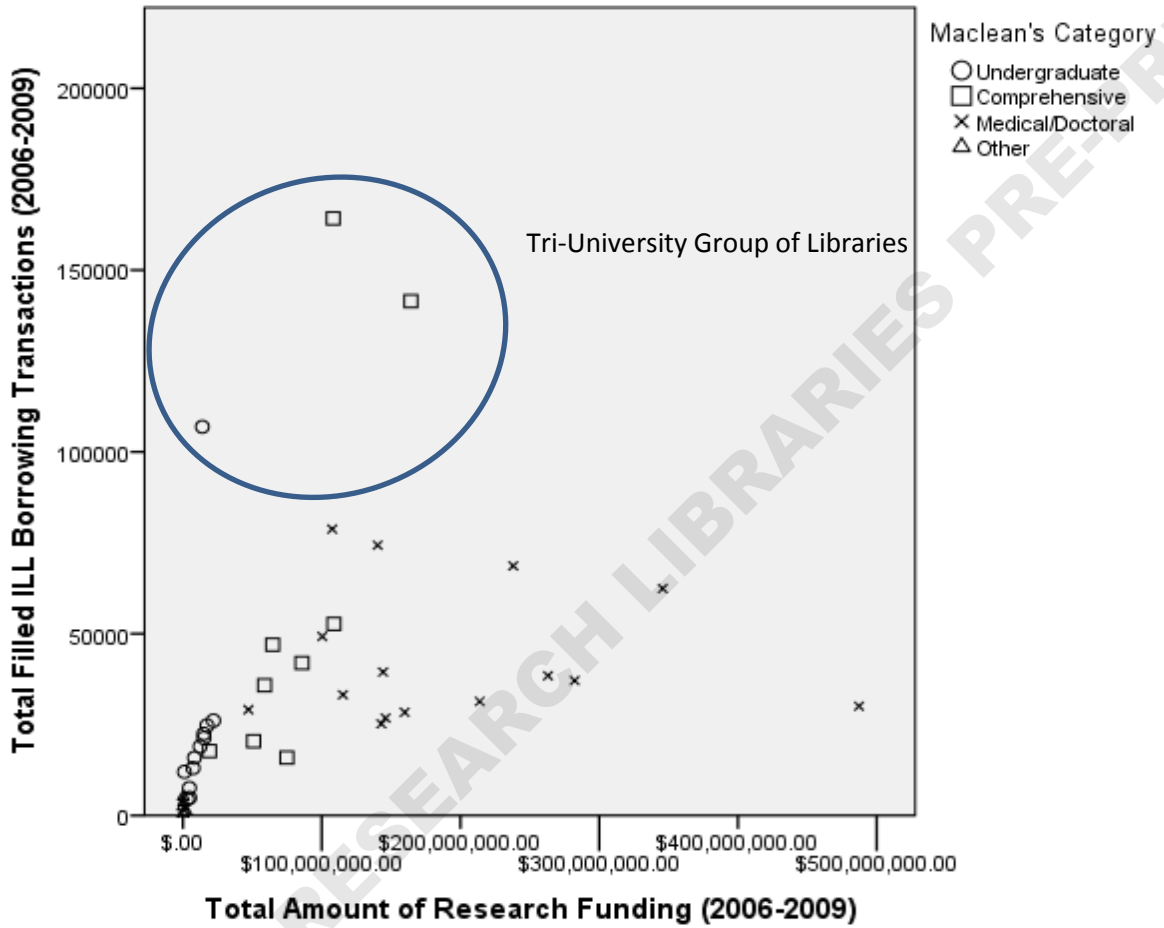
Table 5: Spearman Correlations Between Research Activity Variables and ILL Borrowing, by Maclean's Category

	Undergraduate (N=12)	Comprehensive (N=9)	Medical/Doctoral (N=15)	Other (N=6)
Total Research Funding	0.874**	0.750*	-0.050	-0.058
Total Publications	0.895**	0.783**	0.139	0.483

** p<0.01, * p<0.05

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Figure 1: Relationship Between ILL Borrowing Transactions and Total Research Funding for 42 Canadian Academic Institutions



Notes

- i. Collette Mak, "Resource Sharing among ARL Libraries in the US: 35 Years of Growth," *Interlending and Document Supply* 39, no. 1 (2011): 30.
- ii. Mary E. Jackson. *Assessing ILL/DD Services: New Cost-Effective Alternatives*. With Bruce Kingma and Tom Delaney (Washington, DC: Association of Research Libraries, 2004), <http://www.archive.org/details/assessingillddse00jackrich>.
- iii. M. B. Line and S. J. Ede, "Interlibrary Lending Statistics: Their Collection and Use," *BLL Review* 2, no. 2 (1974): 44-50.
- iv. Joseph A. Williams and David E. Woolwine, "Interlibrary Loan in the United States: An Analysis of Academic Libraries in a Digital Age," *Journal of Interlibrary Loan, Document Delivery and Electronic Reserve* 21 (2011): 165-183.
- v. John Costello and Charles Duffy, "Academic Interlibrary Loan in New York State: A Statistical Analysis," *Journal of Interlibrary Loan and Information Supply* 1, no. 2 (1990): 41-43.
- vi. P. Robert Paustian, "Collection Size and Interlibrary Loan in Large Academic Libraries," *Library Research* 3 (1981): 393-400.
- vii. Rosalind Farnam Dudden, Sue Coldren, Joyce Condon, Sara Katsh, Catherin Morton Reiter and Pamela Lynn Roth, "Interlibrary Loan in Primary Access Libraries: Challenging the Traditional View," *Bulletin of the Medical Library Association* 88, no. 4 (2000): 303-313.

viii. Jonathan Miller, "Primary clientele as a predictor of interlibrary borrowing: a study of academic health sciences libraries," *Bulletin of the Medical Library Association* 85, no.1 (1997): 11-15.

ix. Libby Trudell and James Wolper, "Interlibrary Loan in New England," *College and Research Libraries* 39 (Sept. 1978): 365-371.

x. Costello and Duffy, *Academic Interlibrary Loan in New York State*, 41-43.

xi. Line and Ede, *Interlibrary Lending Statistics*, 44-50.

xii. Miller, *Primary Clientele as a Predictor of Interlibrary Borrowing*, 11-15.

xiii. David Solar, "Electronic Full-Text Articles as a Substitute for Traditional interlibrary Borrowing," *Journal of Interlibrary Loan, Document Delivery and Information Supply* 11, no. 1 (2000): 99-118.

xiv. Cynthia Mae Helms, "The Impact of Databases on Inter Library Loan Borrowing: A Ten-Year Study at a Private University," *Journal of Interlibrary Loan, Document Delivery and Information Supply* 12, no. 1 (2001): 13-26.

xv. Mary E. Jackson, "Will Electronic Journals Eliminate the Need for ILL?" *Interlending and Document Supply* 32, no. 3 (2004): 192-193.

xvi. Williams and Woolwine, *Interlibrary Loan in the United States*, 165-183.

xvii. Paoshan W. Yue and Millie L. Syring, "Usage of Electronic Journals and their Effect on Interlibrary Loan: A Case Study at the University of Nevada, Reno," *Library Collections, Acquisitions, and Technical Services* 28 (2004): 420-432.

xviii. Jackson, *Will Electronic Journals Eliminate*, 192-193.

xix. V. Renee Rheiner, "How Electronic Full Text Journals Impact Interlibrary Loan Article Requests at a Small, Liberal Arts University," *Journal of Interlibrary Loan, Document Delivery and Electronic Reserve* 18, no. 3 (2008): 384.

xx. Lynn Wiley and Tina E. Chrzastowski, "The Illinois Interlibrary Loan Assessment Project II: Revisiting Statewide Article Sharing and Assessing the Impact of Electronic Full-Text Journals," *Library Collections, Acquisitions and Technical Services* 26 (2002): 19-33.

xxi. Helms, *The Impact of Databases on Inter Library Loan* , 13-26.

xxii. Mercedes Echeverria and Pilar Barredo, "Online Journals: Their Impact on Document Delivery," *Interlending and Document Supply* 33, no. 3 (2005): 145-149.

xxiii. Tony Kidd, "Does Electronic Journal Access Affect Document Delivery Requests? Some Data from Glasgow University Library," *Interlending and Document Supply* 41, no.4 (2003): 264-269.

xxiv. Nancy Egan, "The Impact of Electronic Full-Text Resources on Interlibrary Loan: A Ten--Year Study at John Jay College of Criminal Justice," *Journal of Interlibrary Loan, Document Delivery and Electronic Reserve* 15, no. 3 (2005): 23-41.

xxv. Mary Jackson, "The "bigger deal" is OpenURL," *Interlending and Document Supply* 33, no. 3 (2005): 172-174.

xxvi. *Ibid*, 173.

xxvii. Polly P. Frank and Robert L. Bothmann, "Assessing Undergraduate Interlibrary Loan use," *Journal of Interlibrary Loan, Document Delivery and Electronic Reserve* 18, no. 1 (2007): 33-48.

xxviii. Williams and Woolwine, *Interlibrary Loan in the United States*, 165-183.

xxix. Mak, *Resource Sharing among ARL Libraries*, 27.

xxx. Jackson, *Will Electronic Journals Eliminate*, 192-193.

xxxi. Mark T. Kinnucan, "Demand for Document Delivery and Interlibrary Loan in Academic Settings," *Library and Information Science Research* 15 (1993): 355-374.

xxxii. Anna H. Perrault and Marjo Arseneau, "User Satisfaction and Interlibrary Loan Service: A Study at Louisiana State University," *RQ* 35, no. 1 (1995): 90-100.

xxxiii. Ophelia Cheung, Susan Patrick, Brian Cameron, Elizabeth Bishop and Lucina Fraser, "Restructuring the Academic Library: Team-Based Management and the Merger of Interlibrary Loans with Circulation and Reserve," *Journal of Interlibrary Loan, Document Delivery and Information Supply* 14, no. 2 (2003): 5-17.

xxxiv. Martha Davis and Angela Rubin, "Service vs. Services: Customer-Centered Interlibrary Loan Service," *Journal of Interlibrary Loan, Document Delivery & Information Supply* 7, no. 1 (1996): 47-59.

xxxv. Theresa Kappus, "Interlibrary Loan Tsunami: Investigating the Rising Tide of Borrowing Requests at Small Private University," *Journal of Interlibrary Loan, Document Delivery and Electronic Reserve* 19 (2009): 205-217.

xxxvi. Ibid., 213.

xxxvii. Yue and Syring, *Usage of Electronic Journals*, 430.

xxxviii. John M. Budd, "Faculty Publishing Productivity: An Institutional Analysis and Comparison with Library and Other Measures," *College and Research Libraries* 56 (Nov. 1995): 547-554.

xxxix. Dean Hendrix, "Relationships between Association of Research Libraries (ARL) Statistics and Bibliometric Indicators: A Principal Components Analysis," *College and Research Libraries* 71 (Jan. 2010): 32-41.

xl. Canadian Association of Research Libraries, "Statistics/Measures," Canadian Association of Research Libraries, <http://carl-abrc.ca/en/research-libraries/statistics-measures.html> [accessed 7 February 2012].

xli. Canadian Association of Research Libraries, "Home," Canadian Association of Research Libraries, <http://carl-abrc.ca/en.html> [accessed 7 June 2012].

xlii. COPPUL / OCUL / CAUL-CBUA / CREPUQ, "COPPUL / OCUL / CAUL-CBUA / CREPUQ Resource Sharing Agreement Letter of Agreement," Council of Prairie and Pacific University Libraries, http://www.coppul.ca/keydocs/COPPUL_OCUL_CAUL_CREPUQ.pdf [accessed 2 June 2012].

xliii. Canadian Association of Research Libraries, "Statistics/Measures," Canadian Association of Research Libraries, <http://carl-abrc.ca/en/research-libraries/statistics-measures.html> [accessed 7 February 2012].

xliv. Katherine McColgan, e-mail message to author, January 12, 2012.

xliv. Canadian Association of Research Libraries, "Statistics/Measures".

xlvi. Ibid.

xlvi. Henk Moed, "Differences in the construction of SCI based bibliometric indicators among various producers: a first overview," *Scientometrics* 35, no. 2 (1996), 177-191.

xlviii. "University Rankings: Methodology, How We Rank", *Maclean's Magazine*. November 22, 2010, 128.

xlix. Liwen Vaughan, *Statistical Methods for the Information Professional* (Medford, NJ: Information Today, Inc., 2001), 101.

1. England, *Interlibrary Loan and Document Delivery in Canada*, 7, table 8.

li. Jackson, *Assessing ILL/DD Services*, 72, table 79.

lii. Elaine Sanchez, *Higher Education Interlibrary Loan Management Benchmarks* (New York, NY: Primary Research Group, 2009), table 1.4.

liii. B. Stuart-Stubbs, M. Friesen and D. McInnes, *Interlibrary Loan in Canada: A Report of a Survey* (Vancouver: University of British Columbia Library, 1975) 109, table 64.

liv. Jackson, *Assessing ILL/DD Services*, 72.

lv. Anne Beaubien, "ARL White Paper on Interlibrary Loan," *Association of Research Libraries*, http://www.arl.org/bm~doc/ARL_white_paper_ILL_june07.pdf [accessed 6 June 2012].

lvi. Costello and Duffy, *Academic Interlibrary Loan in New York State: A Statistical Analysis*, 42.

lvii. Lynne Porat and Snunith Shoham, "Israeli College Interlibrary Loan Practices: Implications for Israeli Universities," *Interlending and Document Supply* 32, no. 4 (2004): 219-226.

56. Xiu Niu, Hemminger, Bradley, Cory Lown, Stephanie Adams, Cecelia Brown, Allison Level and Merinda McLure, Audrey Powers, Michele Tennant, Tara Cataldo, "National Study of Information Seeking Behavior of Academic Researchers in the United States," *Journal of the American Society for Information Science and Technology* 61, no. 5 (2010): 869-890.

lix. Jackson, *Assessing ILL/DD Services*.

lx. Niu, Hemminger, Lown, Adams, Brown, Level and McLure, "National Study of Information Seeking," 875.

Ixi. Vincent Larivière, Éric Archambault, Yves Gingras and Étienne Vignola-Gagné, “The Place of Serials in Referencing Practices: Comparing Natural Sciences and Engineering with Social Sciences and Humanities,” *Journal of the American Society for Information Science and Technology* 57, no. 8 (2006): 997-1004.

Ixii. Éric Archambault, Étienne Vignola-Gagné, Grégoire Côté, Vincent Larivière, Yves. Gingras, “Benchmarking Scientific Output in the Social Sciences and Humanities: The Limits of Existing Databases,” *Scientometrics* 68, no. 3 (2006): 329-342.

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