



Right-Scaling Stewardship:

A Multi-scale Perspective on
Cooperative Print Management

By Constance Malpas and Brian Lavoie

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#printscale

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March 2014

OCLC Research

Dublin, Ohio 43017 USA

www.oclc.org

1-55653-474-4 (978-1-55653-474-4)

OCLC Control Number: 874660824

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Suggested citation:

Malpas, Constance and Brian Lavoie. 2014. *Right-scaling Stewardship: A Multi-scale Perspective on Cooperative Print Management*. Dublin, Ohio: OCLC Research.

<http://www.oclc.org/content/dam/research/publications/library/2014/oclcresearch-cooperative-print-management-2014.pdf>.

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Acknowledgments

We would like to thank our colleagues at The Ohio State University (OSU) Libraries, especially Carol Pitts Diedrichs who first suggested that an analysis of the Committee on Institutional Cooperation (CIC) and regional print book resources would be useful to ongoing shared print planning efforts, Karla Strieb, who served as our primary point of contact and provided guidance and insights over the course of the project; and Brian Miller, who contributed special expertise on inter-lending practices at OSU and within the CIC UBorrow system. We would also like to thank the CIC Center for Library Initiatives for their interest in and support of this project. We are grateful for the thoughtful feedback received from a webinar audience of CIC library staff to whom we presented an early version of our findings. Finally, we would like to thank our OCLC colleague Lorcan Dempsey, Vice President of Research and Chief Strategist, for encouraging our work on this project.

I. Introduction

The Committee on Institutional Cooperation (CIC), a consortium which includes the Big Ten universities and the University of Chicago, has collectively invested in a shared print repository for little-used print materials, with an initial goal of building a shared collection of 250,000 journal backfile volumes. The scale of this collaboration is regional: CIC members are clustered, with a few exceptions, in the upper Midwest. The consolidation of print holdings across CIC members—at least for now—is partial; each member continues to manage local print collections—particularly books—although cross-institutional integration is increasing. For example, CIC’s new UBorrow service streamlines reciprocal borrowing across local CIC member collections.

While CIC’s shared print activities to date have focused on print journals, interest also exists in cooperative strategies for print monographs. But here the issue is more fraught, not least because of the potential for faculty and student resistance to significant reductions in local holdings. Carol Pitts Diedrichs (2013), Director of The Ohio State University (OSU) Libraries notes that “virtually no one prefers to use the [journal] content in print rather than electronic form. As a result, it’s fairly easy to make a policy decision that a single print copy of this journal content can . . . serve the long term needs of all members of the CIC.” In contrast, few predict the complete disappearance of monographic print collections. Rick Anderson (2013, 1), Associate Dean for Scholarly Resources & Collections at the University of Utah, in a piece tellingly subtitled “The Declining Importance of Library Books and the Rising Importance of Special Collections” urges research libraries to shift focus from collecting “commodity” print materials to “gathering and curating . . . rare and unique documents” but nevertheless concedes that such a shift is one of degree rather than wholesale. Local print book collections will remain for the foreseeable future, and so in contrast to the print journal model of centrally housed, shared collections, cooperative strategies for print books are likely to take a hybrid form with centralized repositories operating alongside coordinated networks of local collections. Two questions thus emerge: *what portions of the local print book collection can be more efficiently managed “above the institution,” and which should be managed locally?*

The CIC example illustrates broader trends. A key factor driving the transformation of the 21st century academic library is the rising opportunity cost of locally managed print

collections. Even as the value of on-campus print collections is questioned in the face of declining use and an expanding array of digital alternatives, the resources consumed in maintaining them are needed to support new service priorities. For example, Stanford University's redesigned Engineering Library, which opened in 2010, retained only about 10,000 of the 80,000 books in its collection; the rest moved to off-site storage. The library occupies less than half the square footage of its previous site, with much of the space devoted to private and collaborative study areas (Haven 2010). Yet the recent furor at the New York Public Library, where plans to remove large numbers of books from the main stacks met with public resistance and a lawsuit, reminds us that attachment to print books remains strong in many quarters. Nevertheless, the centrality of the traditional print collection to the academic library's mission appears to be fading. A recent survey by Ithaka S+R (Long and Schonfeld 2013, 7) appears to confirm this trend, reporting that "[a] minority of respondents, even at doctoral institutions, believes that purchasing print books to build research collections is important, while the large majority believes that building local print collections has declined in importance."

For the moment, the future of print collections is bound up in strategies aimed at reducing the cost of maintaining print collections, while at the same time finding ways to leverage more value out of the legacy print investment. While the parameters of such a solution have yet to be definitively worked out, some general contours are evident. First, the locus of print management is moving "above the institution," as print materials are increasingly viewed as a shared asset to be managed cooperatively. Second, accumulating experience from existing and planned cooperative print management projects suggest that regions are favored as the appropriate scale for cooperation of this kind. Third, rather than aiming to create fully consolidated, centrally stored shared print collections, a strategy of "distributed consolidation" is much more common, where institutions maintain local print collections (albeit possibly reduced in size, and possibly in coordination with a centralized shared print repository), but link them together through arrangements that support cooperative approaches to collection development, management, and access. The CIC example described above embodies all of these trends.

This report explores regional-scale cooperative print strategies in the context of a local collection (OSU) participating in a regionally-scaled consortial (CIC) shared print initiative. The goal is to provide an empirically-based assessment of the potential for a distributed cooperative strategy for print books, based on the principle of a shared, centrally-managed core, and a network of local collections. The analysis is counterfactual, in the sense that we use WorldCat bibliographic data to examine what these collections would look like in the event they were organized in this form. While our intent is to provide analysis that can inform ongoing discussions within the CIC regarding an expansion of current shared print activities to include monographic materials, our findings and assessments do not necessarily reflect the

intentions or suggest any commitments on the part of CIC and its member institutions. However, we believe this report provides interesting insight into cooperative print management organized on the collaborative scale of a regionally-based consortium, and while focused on OSU and CIC, will be quite relevant for other academic institutions and consortia as well.

Data Sources

The focus of our analysis is two-fold: the OSU print book collection, and the collective print book collection of the CIC membership. Most of our analysis will be placed in the context of these two perspectives. Our findings are derived primarily from a January 2013 snapshot of the WorldCat bibliographic database and holdings file, which include approximately 300,000,000 bibliographic records and 2 billion holdings.

CIC member print book holdings were derived from a list of OCLC symbols pertaining to each institution, developed in consultation with our partners at OSU Libraries. Law and medical library holdings, as well as those of other specialized collections, were included where appropriate. *Please note that the analysis which follows is based on institutional collections as they are represented in WorldCat.* To the extent that local collections are not registered in WorldCat, they will similarly not be reflected in our analysis.

Terminology

The following terminology is used throughout this report:

- *Print book*: a book¹ manifested in printed form. We exclude materials explicitly cataloged as theses, dissertations, or government documents from the analysis, as well as books in non-print formats such as e-books.
- *Publication*: a distinct edition or imprint of a work. For example, *The Structure of Scientific Revolutions* is a work—a distinct intellectual creation—by the author Thomas S. Kuhn. This work has appeared as several different publications, two of which are shown below.
 - Kuhn, Thomas S. (1962). *The Structure of Scientific Revolutions* (1st ed.). Chicago: The University of Chicago Press.
 - Kuhn, Thomas S. (1996). *The Structure of Scientific Revolutions* (3rd ed.). Chicago: The University of Chicago Press.

These would be counted as two distinct print book publications in our analysis.

- *Holding*: an indicator that a particular institution (a library or some other organization) holds at least one copy of a particular publication in its collection. Note that a holding says nothing about the number of physical copies owned by the institution, other than at least one copy is available. For example, according to their catalog, the Ohio State University Libraries own three copies of the 1996 edition of *The Structure of Scientific Revolutions*. All three copies would be represented in WorldCat by a single holding associated with the Ohio State University Libraries (OCLC symbol OSU).
- *Collective collection (or collective resource, e.g., "collective CIC print book resource")*: the combined holdings of a group of institutions, with duplicate holdings (i.e., those pertaining to the same publication) removed. This yields the collection of distinct publications that are held across the collections of the institutions in the group.
- *OCLC symbol*: a unique three or five character string assigned to a particular institution (or institutional collection). An institution's OCLC symbol is "attached" to a WorldCat bibliographic record to indicate that the institution holds at least one copy of the material described in the record.
- *Library centers of distinction*: distinctive clusters of topically-related library resources that reveal local or group collection strengths as measured by title count (compared to other holding libraries) or comprehensiveness (compared to the published record as it is represented in WorldCat).
- *Returnable inter-lending*: borrowing or lending transactions for physical inventory (print books, bound journals, audiovisual materials etc.) that is returned to the lending library.

II. The Print Book Landscape

Just as OSU's print book collection represents only part of the CIC collective print book resource, the CIC collection itself represents only part of the collective print book resources available at scales of aggregation beyond the CIC membership. Figure 1 illustrates the broader print book landscape in which both OSU and the CIC are embedded, in the form of a series of semi-concentric shapes of increasing geographical scale—from local to global.

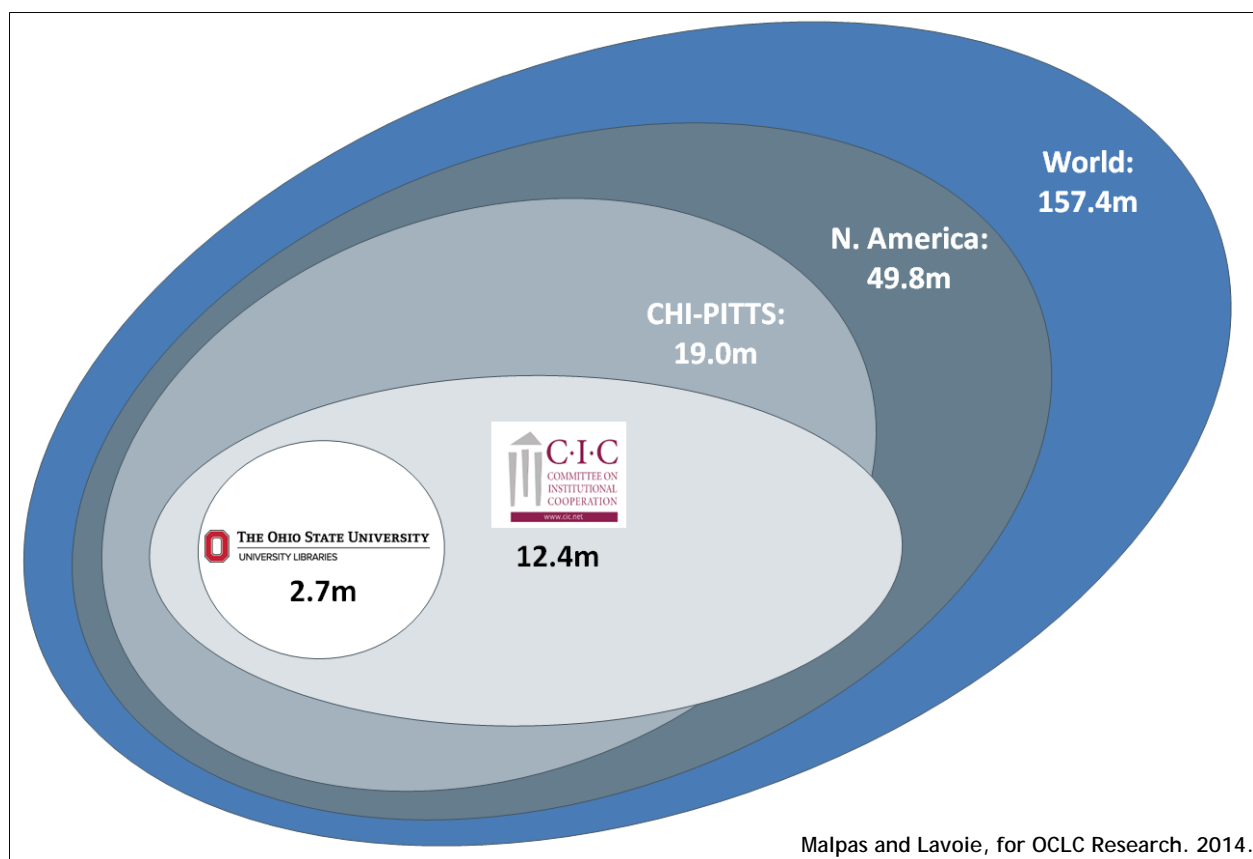


Figure 1. Print book landscape as represented in WorldCat, January 2013 (millions of distinct print book publications)

In terms of practical matters of inventory control, academic print book collections have few peers. An academic print book collection typically contains hundreds of thousands—and at

mid-size and larger institutions, possibly millions—of physical items on shelves. As figure 1 shows, the OSU print book collection includes 2.7 million different publications. As a point of reference, consider that an average 187,000-square-foot Wal-Mart Supercenter offers only 142,000 different items (Wal-Mart 2013).

The CIC collective print book collection—the aggregated print book holdings of the thirteen member institutions, with duplicate holdings removed—amounts to 12.4 million distinct publications. This collective resource is more than four times the scale of OSU's local print book collection, and includes nearly 10 million print book publications not available in the OSU collection.

The CHI-PITTS mega-region expands the frame of reference to regional scale. A mega-region is a geographical conglomeration of multiple urban centers and their hinterlands, bound together through shared infrastructure, mutual economic interests, and possibly even cultural similarities. CHI-PITTS encompasses a swath of the northern Midwest stretching from Chicago to Pittsburgh. The CIC membership is, with a few exceptions, located in or very near the CHI-PITTS mega-region; the region also includes many non-CIC academic institutions, public libraries and other collecting organizations. The collective CHI-PITTS regional print book resource accounts for 19 million distinct publications, about half again as large as the CIC collective collection.

Expanding the scope to include most of North America (US and Canada), the size of the collective print book resource increases to 49.8 million distinct print book publications—more than 1.5 times larger than the CHI-PITTS regional print book resource. Finally, the largest scale of all—the global print book resource—consists of nearly 160 million distinct print book publications, about three times larger than the North American collection, and 60 times larger than OSU's local collection.

The print book landscape depicted in figure 1 suggests several key insights into how scale impacts the characteristics of a collective print book resource. First, *scale adds scope and depth*. This is vividly illustrated in figure 1, where collective print book resources rapidly increase in size as the scale of geographic aggregation increases. Moving from local scale (OSU) to consortial scale (CIC) yields an additional 9.7 million print book publications. Similarly, the CHI-PITTS regional resource includes about 7.9² million books not available within the CIC membership; the North American resource adds more than 30 million additional publications to what is available in CHI-PITTS; and the global print book resource extends the North American collection by almost 110 million distinct publications. Each successive level of aggregation adds a proportionately significant layer of additional print book publications to the collective resource.

While increasing the scale of a collective print book resource increases its scope and depth, it also increases the “core” of widely-held publications as well. This leads to a second insight: *uniqueness or scarcity is relative*. As the scale of aggregation expands, publications that may appear rare or scarce—i.e., not widely held—at one level of aggregation may in fact be in plentiful supply at higher levels of aggregation. The degree of “uniqueness” of a particular print book resource is not intrinsic to the resource itself, but instead depends on the frame of reference in which it is placed.

Finally, the third insight is that *coverage requires collaboration*. As figure 1 suggests, no single collection—or even collective collection, short of global scale—covers the full extent of the world-wide print book resource. On a smaller scale, the OSU print book collection only covers a fraction of the CIC collective print book resource. This suggests that any print strategy that aims to cover a print book resource at anything above local scale will need to be based on multi-institutional cooperation—and the scale of cooperation must grow as the scale of the resource grows.

We will see examples of each of these insights in action in our analysis of the OSU and CIC print book resources. Taken together, these three insights frame many of the issues and challenges associated with organizing cooperative print management strategies.

OSU and CIC Print Book Resources

The OSU print book collection includes approximately 2.7 million distinct publications, while the CIC collective print book resource, which aggregates the print book collections of twelve other CIC institutions with that of OSU, includes about 12.4 million distinct publications. OSU represents the median print book collection size for the CIC membership as a whole. OSU’s collection is about one third smaller than the largest CIC member collection (University of Chicago, 4.1 million publications), and two-thirds larger than the smallest collection (Purdue University, 900,000 publications).

Two key factors driving any cooperative print strategy are the degrees of uniqueness and redundancy evident across the collections of participating institutions. We begin our analysis by examining the relative distinctiveness of OSU’s print book collection compared to the CIC collective print book resource, as well as the degree of distinctiveness evident across the print book collections of the CIC membership as a whole.

Table 1 reports the percentage of OSU’s print book holdings that are duplicated in the individual collections of the rest of the CIC membership.

Table 1. Percentage of OSU's print book collection duplicated in other CIC member collections

CIC institution	Percent
Illinois	49
Michigan	49
Chicago	46
Wisconsin	44
Indiana	43
Minnesota	41
Iowa	37
Penn State	37
Michigan State	35
Northwestern	32
Nebraska	26
Purdue	20

The data reported in table 1 shows that no CIC member can individually account for as much as half of OSU's print book holdings. Illinois and Michigan—two of the largest CIC collections—exhibit the largest overlap, with each able to account for 49 percent of OSU's print book holdings. The overlap with Purdue's collection—the smallest CIC print book collection—only accounts for a fifth of OSU's print book holdings. There is a clear correlation between overlap and size: as one would expect, the largest CIC collections tend to account for the largest percentages of OSU's collection. However, even the largest CIC collections fall far short of subsuming everything contained in the OSU collection. The data in table 1 suggest that a significant degree of uniqueness attaches to OSU's print book holdings *vis-à-vis* the print book collections of the rest of the CIC membership, at least when compared on a bilateral basis.

Table 2 reverses the comparison shown in table 1, reporting the relative distinctiveness of other CIC member print book collections *vis-à-vis* OSU's collection.

Table 2. Percentage of CIC member institutions' print book collections also held by OSU

CIC member institution	Percent
Purdue	59
Nebraska	58
Northwestern	48
Michigan State	48
Penn State	47
Iowa	42
Minnesota	39
Indiana	39
Wisconsin	35
Chicago	34
Michigan	34
Illinois	31

As the data in table 2 indicate, OSU lacks significant portions of the print book collections of each CIC member, ranging from more than 40 percent of Purdue's collection, to almost 70 percent of Chicago's collection. Again, the size of the comparator collection correlates strongly here. However, even the smallest collection—Purdue—includes a significant proportion of materials not available at OSU.

Taken together, the data in tables 1 and 2 suggest that while no CIC member collection can fully substitute for, or even reasonably approximate, the OSU collection, neither can OSU's collection substitute for, or reasonably approximate, that of any other CIC member. If we can extrapolate from these OSU-focused results to the general CIC experience, we find that CIC print book collections are not identical, but in fact vary considerably from one another—not just in size, but in composition as well. Each CIC print book collection is at best a partial substitute for any other print book collection in the CIC.

The relative distinctiveness of each CIC collection can be viewed from a different perspective by moving from bilateral collection comparisons to a broader frame of reference in the form of the CIC collective print book resource as a whole. Table 3 reports the percent of each CIC member's print book collection that is held by at least one other CIC member.

Table 3. Percent of local print book collection held by at least one other CIC member

CIC member institution	Percent
Purdue	93
Nebraska	93
Iowa	89
Michigan State	88
Penn State	85
Northwestern	83
Ohio State University	83
Indiana	83
Minnesota	81
Wisconsin	80
Illinois	79
Michigan	76
Chicago	76

While comparison of OSU's print book collection against those of individual CIC members indicates that a maximum of 49 percent of OSU's print book holdings are duplicated at any other CIC institution, this high degree of distinctiveness largely vanishes in the broader context of the CIC print book resource. As table 3 shows, when the scale of comparison is elevated to the consortial level, duplication of OSU's collection rises to 83 percent—in other words, 83 percent of OSU's print book holdings are available elsewhere in the CIC. Even the largest CIC print book collections are largely duplicated within the collective CIC print book resource: for example, three-quarters of the largest collection—Chicago—is duplicated elsewhere in the CIC.

The negative relationship between scale of comparison and distinctiveness extends to the regional level. If OSU's print book holdings are compared to those of the collective regional print book resource in the CHI-PITTS mega-region, we find that 90 percent of OSU's print book collection is held by at least one other regional institution, with only about 10 percent of OSU's print book holdings unique to its collection *vis-à-vis* the rest of the CHI-PITTS region.

These results suggest that the collecting decisions that formed OSU's print book holdings, while only fractionally duplicated by any single CIC member, are largely subsumed within the collective decision-making of the entire CIC membership—and even more so when the collecting behaviors of all institutions located in the CHI-PITTS region are taken into account.

This is an example of one of the insights discussed earlier: *uniqueness is relative*. In this case, the uniqueness of OSU's print book holdings apparent in bilateral comparisons diminishes considerably when the scale of comparison expands to the consortial and regional levels.

Assuming OSU is indicative of the general CIC experience, we can conclude that CIC institutions are for the most part managing materials in their local print book collections that are being managed by other institutions in the consortium (i.e., within established cooperative arrangements), and/or within the surrounding CHI-PITTS region (i.e., relatively close by).

Rare and Core Materials at the Local and Consortial Levels

In the last section, we analyzed the relative distinctiveness of CIC member print book collections, and concluded that while they are individually quite distinct from each other, they are for the most part duplicated within the collective CIC print book resource. Yet, a small portion of the OSU collection seems to be unique within the consortial and regional contexts.

An important consideration for any cooperative print strategy is the degree of uniqueness and redundancy associated with local collections in the context of the collective holdings of the participating institutions. Indeed, one can plausibly argue that from both a local and consortial perspective, much of the cooperative strategy will be formulated around the materials that are relatively scarce or *rare*, and those that are relatively widely-held, or *core*. In this section, we isolate the rare and core segments of the OSU and CIC print book resources, sketching a basic picture of their relative sizes and salient characteristics, and sharpening our understanding of the nature of distinctiveness across print book collections at both the local and consortial level.

Figure 2 provides a view of the OSU print book collection, organized around the relative distinctiveness of its holdings in the context of the other 12 members of the CIC. The pie chart in figure 2 divides the OSU print book collection into four categories:

- OSU print book publications held by **3 or fewer** CIC members (including OSU)
- OSU print book publications held by **between 4 and 7** CIC members (including OSU)
- OSU print book publications held by **between 8 and 10** CIC members (including OSU)
- OSU print book publications held by **more than 10** CIC members (including OSU)

Although these distinctions are arbitrary,³ they are nevertheless helpful in isolating the most redundant and distinctive portions of OSU's print book collection *vis-à-vis* the CIC membership. For our purposes, the two "extreme" slices of the pie are of special interest: the portion of the collection held by three or fewer CIC members, and the portion held by more than 10 CIC members. These slices will serve as proxies for the most distinctive portion of OSU's print book holdings—the *rare* materials—and the portion that is most widely-held across the CIC—the *core* materials.

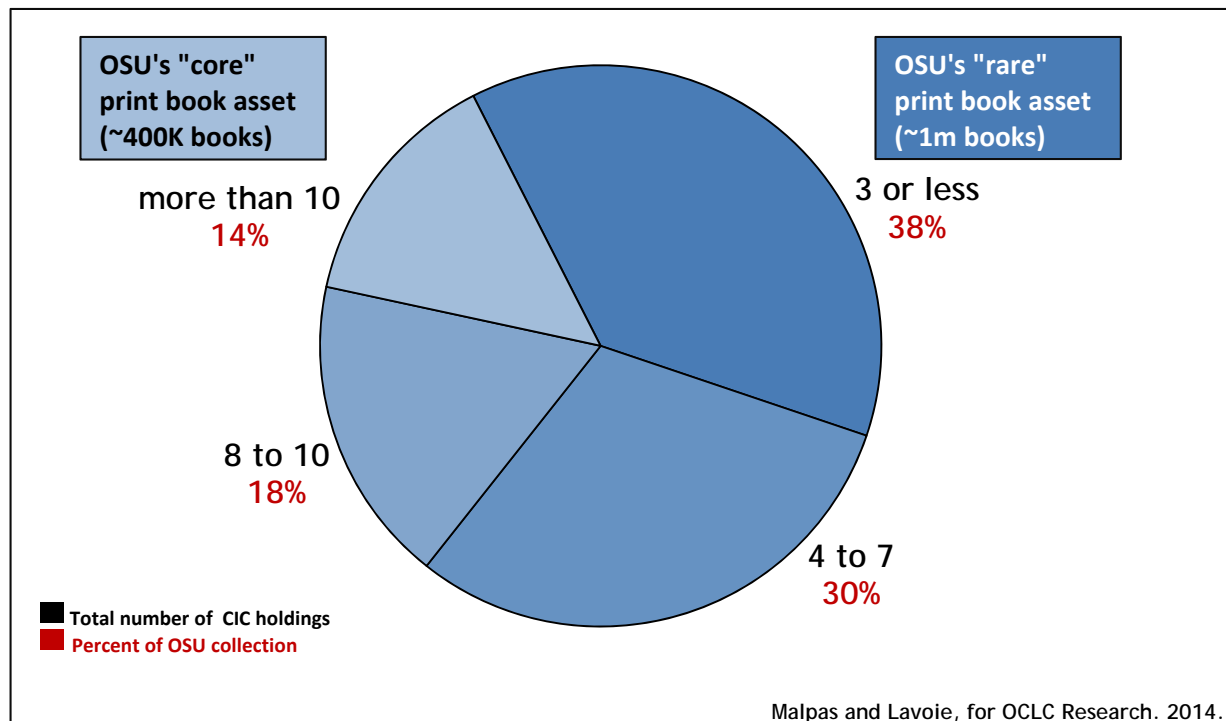


Figure 2. OSU's print book holdings in context of rest of CIC members

The results in figure 2 indicate that 38 percent (approximately 1 million books) of OSU's print book holdings are relatively rare in the context of the CIC, in the sense that they are only available at OSU and at most two other CIC institutions. In contrast, a relatively small proportion of OSU's print book collection—14 percent (approximately 400,000 books)—represents print books which all or nearly all CIC members hold. Together, these endpoints account for a little more than half of OSU's collection.

At first glance, these results seem to contradict, and indeed invert, those discussed in the previous section, where we found that the vast majority (83 percent) of OSU's collection was duplicated in the holdings of other CIC members, while only a relatively small portion was unique to OSU *vis-à-vis* the rest of the CIC. In fact, the results reported in figure 2 complement these findings, and serve to clarify the nature of distinctiveness and redundancy in the OSU print book collection.

The findings in figure 2 differ from those discussed earlier in that they reflect a more expansive metric for distinctiveness that measures “rareness” rather than “uniqueness.” Relatively few OSU print book holdings are unique in the sense that OSU is the sole CIC member that includes these publications in its collection; on the other hand, a substantial number (about 1 million) are “rare” in the sense that only a few CIC institutions hold them along with OSU. In short, we find that *while uniqueness is rare, rareness is common*.

Whether or not rareness equates to high value is an open question, of course, but a cooperative print strategy that aspires to reduce redundant investment while identifying and conserving “rare” materials will find that the latter objective potentially involves special attention for a large segment of materials. It is interesting to note that in the context of the OSU print book collection, the rare segment is more than twice as large as the core segment. Acknowledging that the boundaries of the segments are arbitrarily defined, this result still suggests significantly more investment by OSU in its distinctive print book asset, compared to the core materials that represent the highest *collective* investment within the CIC.

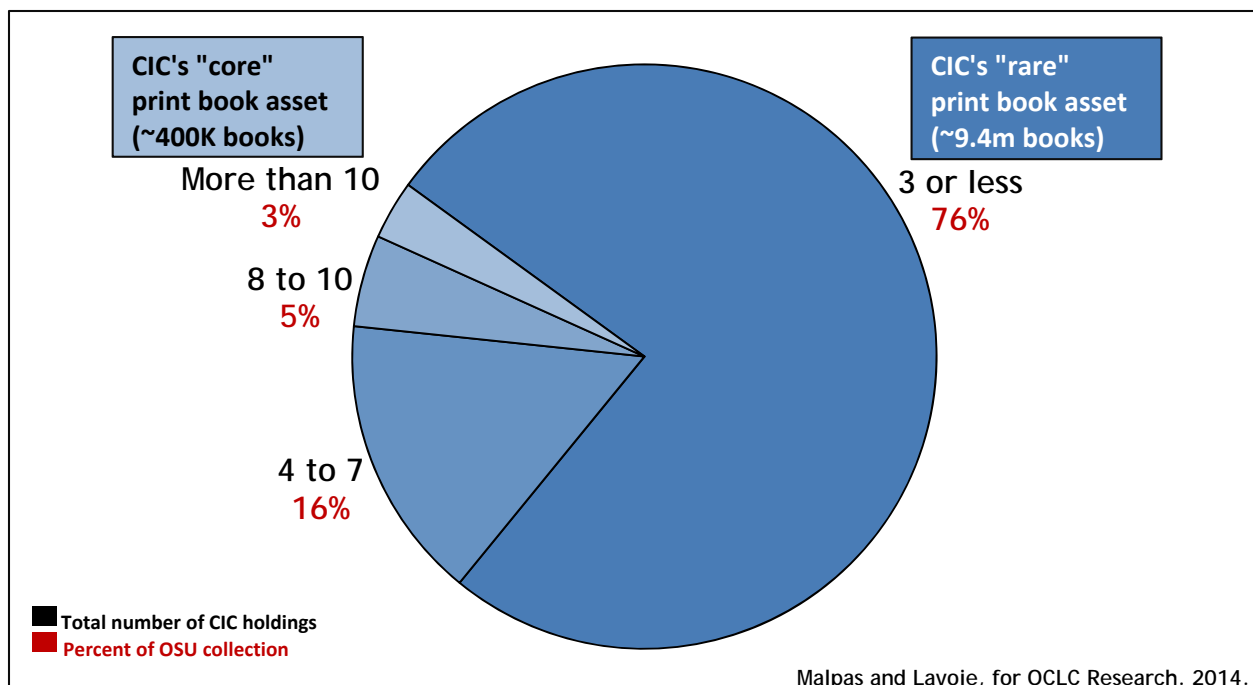


Figure 3. Relative scarcity and redundancy of CIC print book holdings

Figure 3 illustrates the same segmentation of the collective CIC print book resource as that of the OSU collection in figure 2. The most striking difference between the two figures is the proportion of materials associated with the rare segment of the CIC collection: 76 percent, compared to less than 40 percent for OSU. The core segment, in contrast, accounts for only 3 percent of the CIC collective collection.

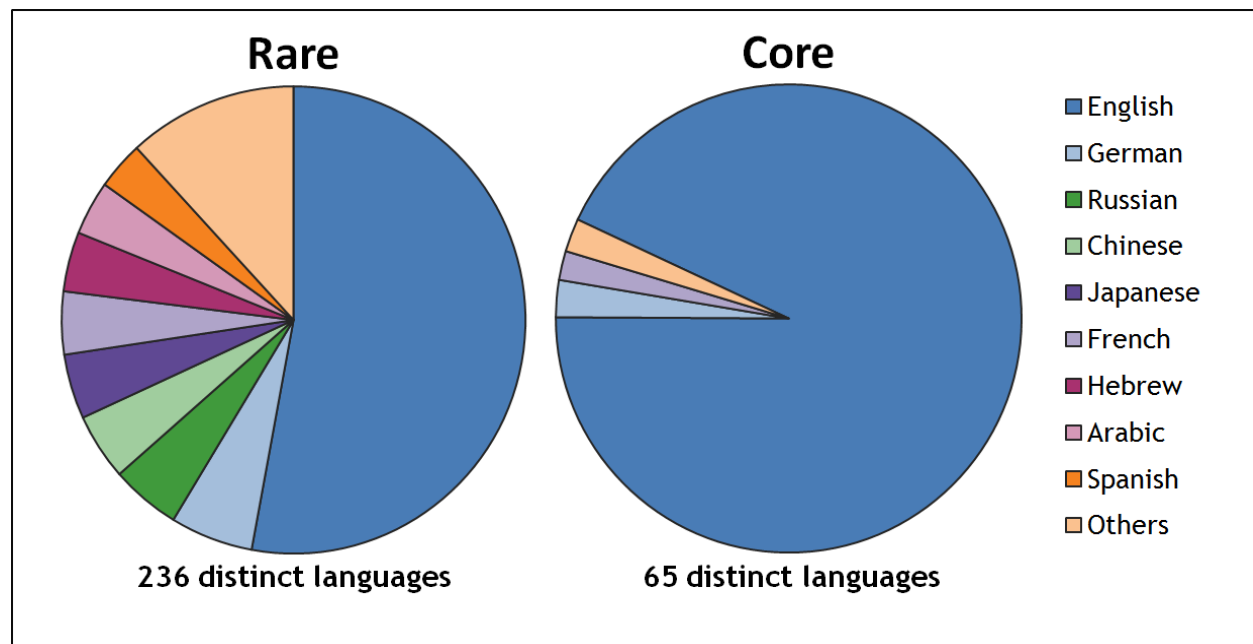
The dramatic expansion of the rare segment when moving from local to consortial level is due to a “long tail” effect. As the analysis of the OSU collection suggests, each local collection has a significant rare segment—materials that are not widely held across the consortia membership. Aggregation across these rare segments is equivalent to aggregating across the “long tail”—that is, across print book holdings that are by definition relatively rare within the CIC context. Because these materials are not widely held, the number of duplicate holdings across the CIC that are filtered out through aggregation will be relatively few. The collective (consortial-scale) rare segment will therefore expand rapidly as more and more local collections are added to the collective resource. In short, the long tail of local collections is amplified at larger scales, and the proportion of the collective collection captured by the rare segment expands accordingly.

In terms of the core segment—the most widely-held or redundant materials—the effect is the reverse. Because the books in this segment by definition are held by most if not all CIC members, aggregation across local collections will result in most consortial holdings associated with these materials being filtered out as duplicates. The collective (consortial-scale) core segment will therefore expand very slowly as more and more local collections are added to the collective resource. In particular, the absolute number of books in the CIC collective core segment only slightly exceeds that of the OSU local collection.⁴

These characteristics—where a collective print book resource exhibits a small core of widely-held materials, coupled with a long tail of rare or scarce materials—sharpens our understanding of one of the insights discussed earlier: *scale adds scope and depth*. In the case of the CIC, the collective rare segment (9.4 million distinct print book publications) is about 25 times larger than the collective core segment (400,000 publications). Scaling local print book collections up to the consortial level builds the long tail, and produces a resource with much greater scope and depth than what is available in any of its constituent local collections.

The fact that three-quarters of the collective CIC print book resource falls into the rare segment also illustrates one of the other insights: *coverage requires collaboration*. The vast majority of the CIC collection is held by three or fewer institutions, suggesting that any consortial-scale strategy to manage the full scope of the CIC collective print book collection, or even a substantial portion of it, will require collaboration extending across the CIC membership.

The rare and core segments highlighted in figures 2 and 3—that is, the *most* and *least* distinctive portions of the OSU and CIC print book resources—are useful starting points for strategic planning around a consortial-scale cooperative print strategy. As such, it is useful to construct a rudimentary profile of the materials in each segment, as a first attempt at gaining a better understanding of the “average” type of material associated with each. To this end,



we will characterize the rare and core segments of the OSU and CIC collections along three dimensions: language of content, age, and broad subject classification.

Figure 4. Distribution of languages present in the rare and core segments of the OSU print book collection

Figure 4 reports the distribution of languages present in the rare and core segments of the OSU print book collection. In regard to the most distinctive, or rare, materials, a little over half (53 percent) have English-language content, while the remainder are divided among 235 other languages, with German, Russian, and Chinese particularly prominent. In contrast, the least distinctive, or core, materials in the OSU collection are almost entirely English-language in content (93 percent), with the rest distributed over a comparatively narrow range (64) of additional languages.

Malpas and Lavoie, for OCLC Research. 2014.

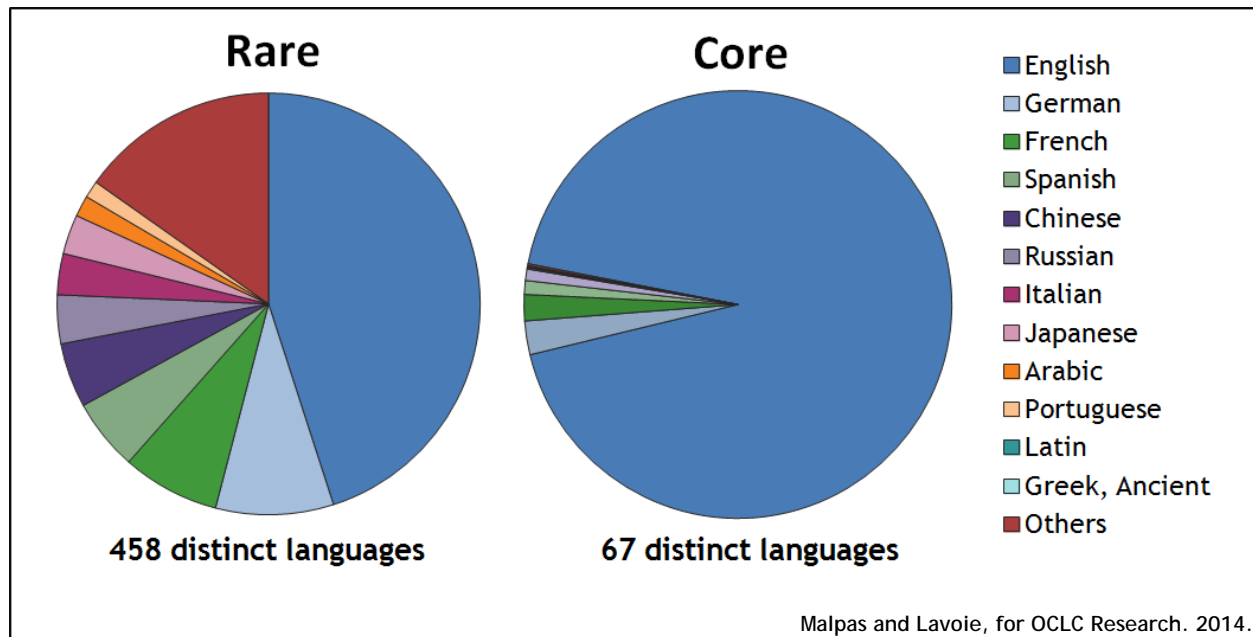
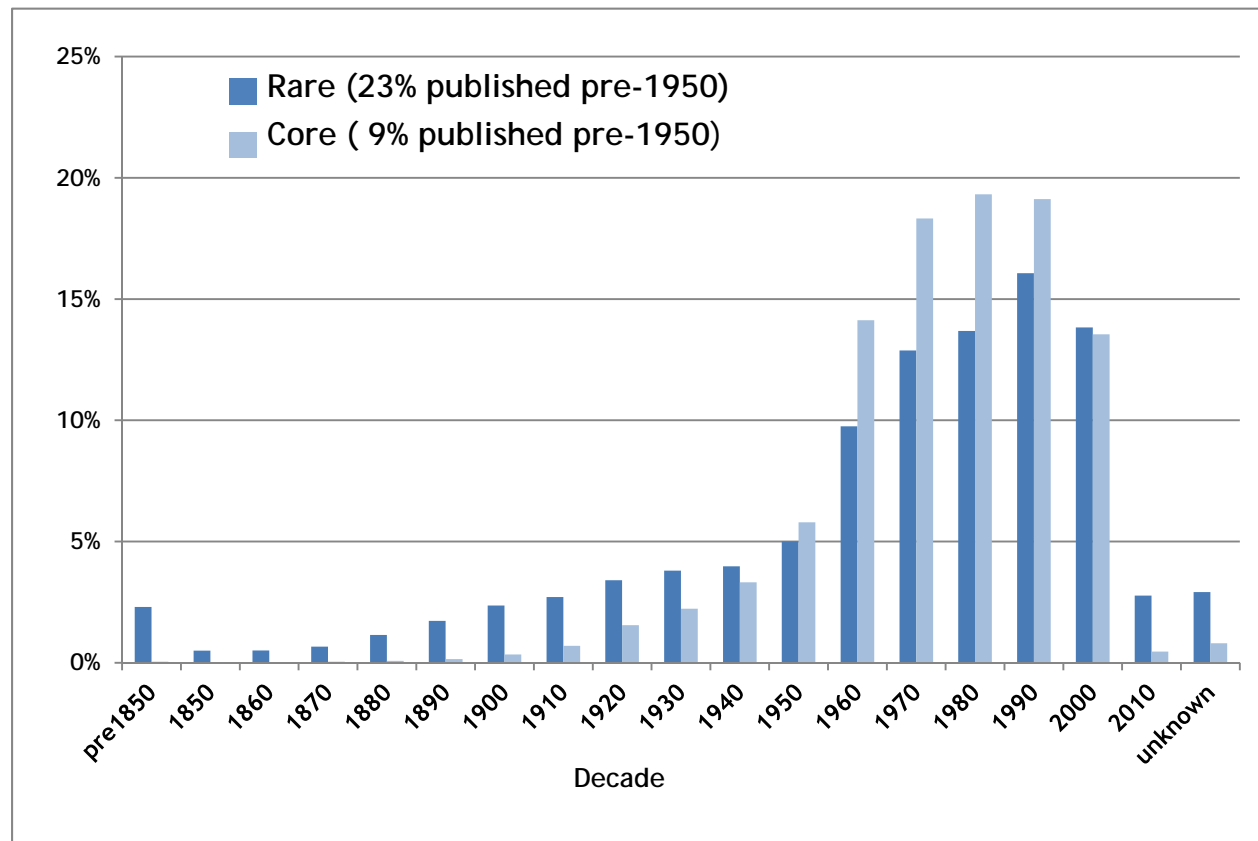


Figure 5. Distributions of languages present in the rare and core segments of the CIC collective print book collection

Figure 5 illustrates the language distributions for the rare and core segments of the CIC collective print book resource. The general contours of these results are similar to those for the OSU collection, with two exceptions. In the CIC rare segment, the portion of materials representing English-language content is a bit less than half (45 percent), compared to 53 percent for OSU. Moreover, the non-English language content is distributed over a much wider range of languages—457 or nearly twice as many as we found in OSU’s local collection. In contrast to the rare materials, however, the language distribution profile for the CIC core segment is virtually identical to that of OSU.

The increase in both the relative size and diversity of the non-English language distribution evident when the rare segment is elevated “above the institution”—from local to consortial scale—is yet another example of the insight that *scale adds scope and depth*. As figure 5 shows, aggregation over many local print book collections yields a collective resource that is deeper and more diverse in its representation of non-English language content than what is typically available in a local collection.



Malpas and Lavoie, for OCLC Research. 2014.

Figure 6. Age distribution (by publication decade) of the rare and core segments of the OSU print book collection

Figure 6 shows the percentage of each segment published prior to 1850, and in each decade thereafter. It is clear from the chart that the age of the rare materials skews a bit to the left—that is, toward the “older” end of the distribution, while the age of the core materials skews toward the right—that is, toward the “younger” end of the distribution. The median date of publication for a print book in the rare segment is 1978; in the core segment, it is slightly more recent (1981). Moreover, only 9 percent of the materials in the core segment were published prior to 1950, compared to nearly a quarter of the materials in the rare segment.

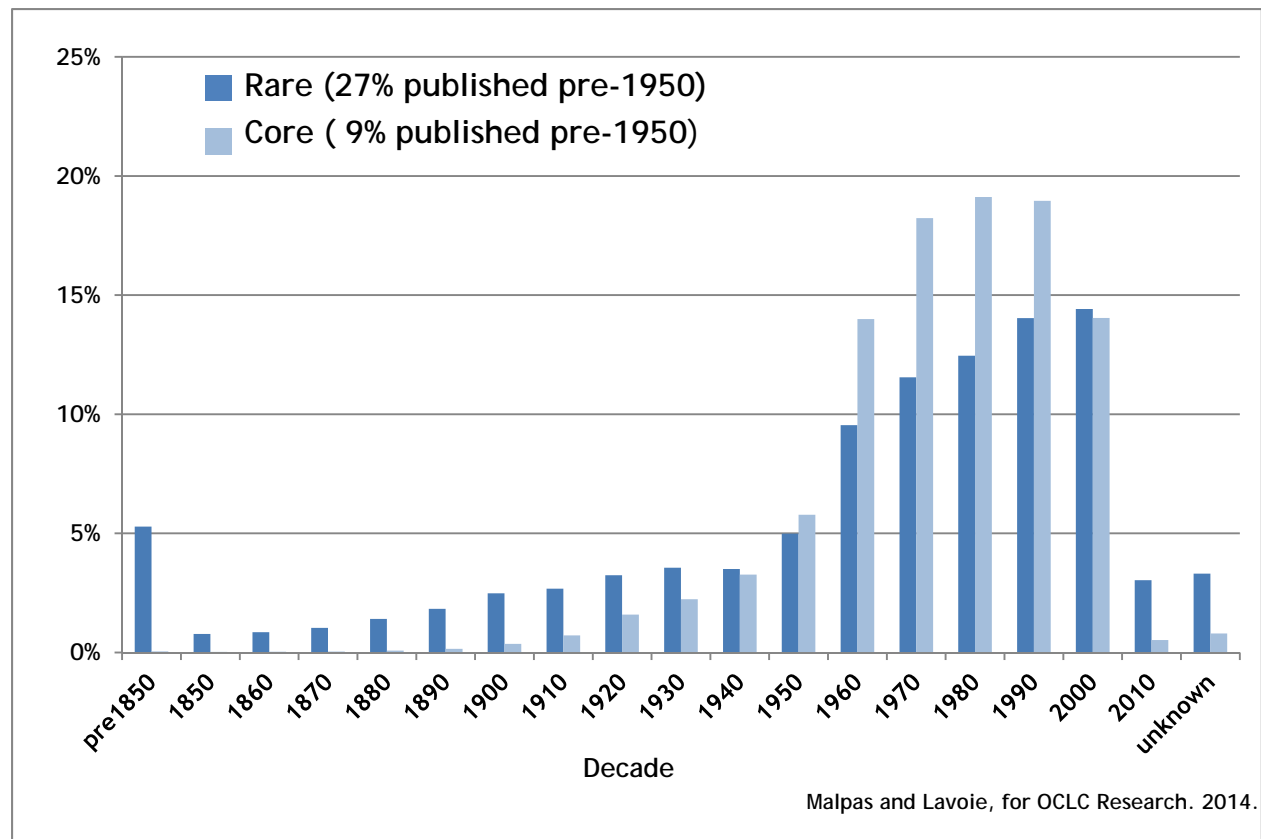


Figure 7. Age distribution of the rare and core segments of the CIC collective print book collection

Figure 7 provides the corresponding age distribution for the materials in the rare and core segments of the CIC collective print book resource. In this case, the profile is virtually identical to that of the OSU collection, with rare materials skewed toward the earlier decades, and core materials skewed toward more recent ones. One interesting divergence between the CIC and OSU age profiles is that the former shows a larger percentage of materials falling in the oldest (pre-1850) category: 5 percent compared to 2 percent. Subsequent decades, up to and including 1900, show slightly higher percentages for CIC than for OSU. All of this leads to a higher percentage of materials published before 1950 for the CIC collection (27 percent) compared to the OSU collection (23 percent).

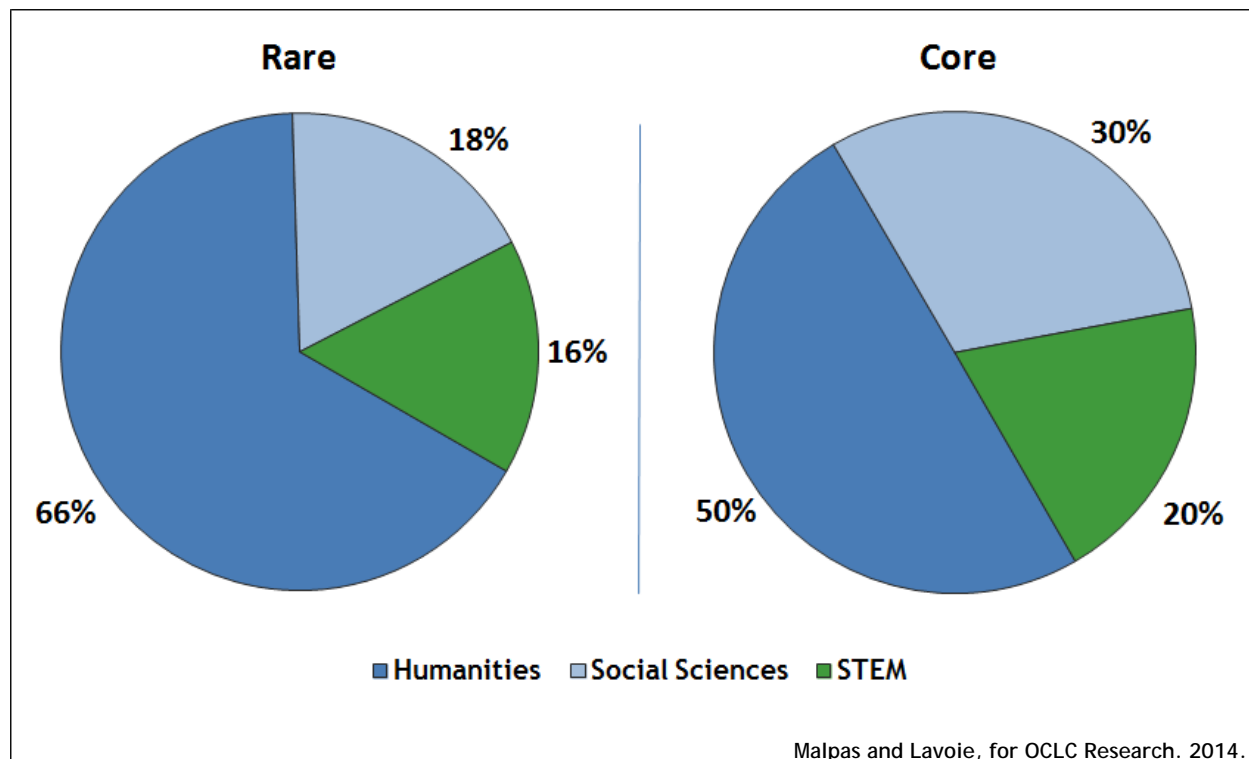
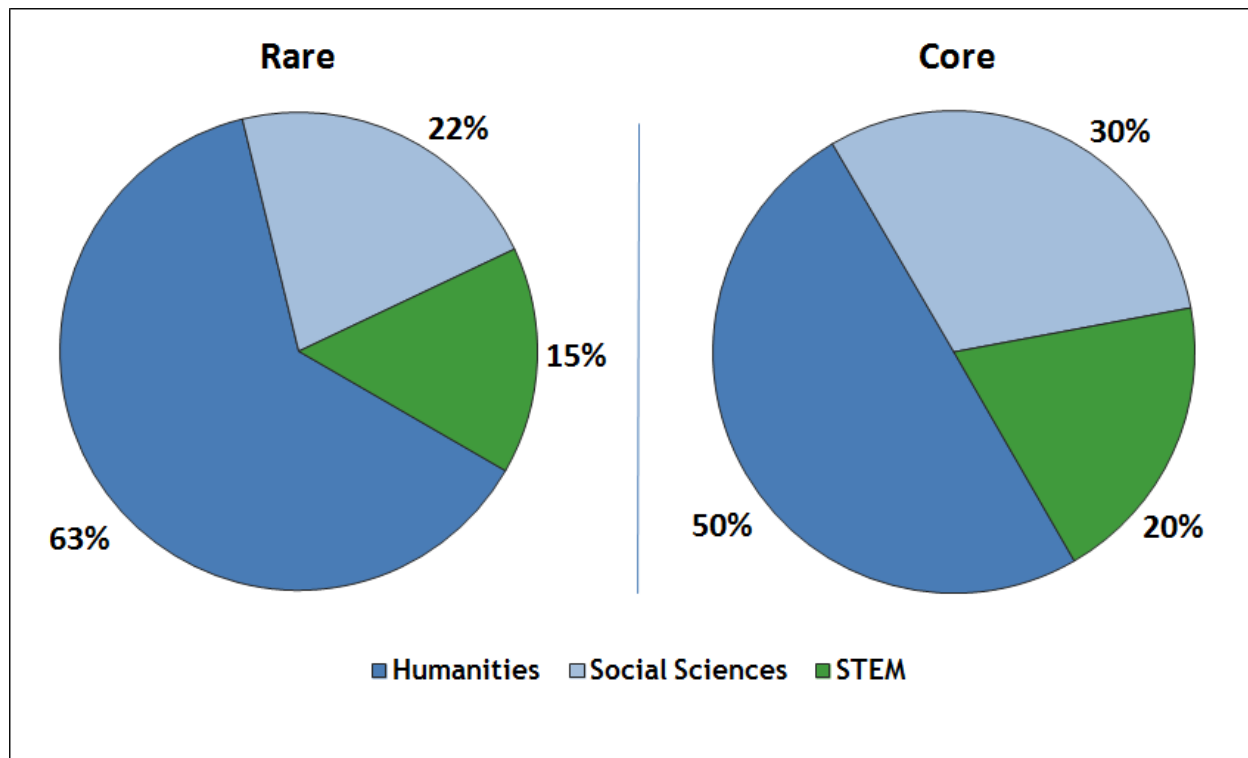


Figure 8. Broad subject breakdown of the rare and core segments of the OSU print book collection

Figure 8 shows the breakdown of the rare and core segments of OSU's print book collection by broad subject areas—humanities, social sciences, and STEM (science, technology, engineering, and mathematics). In the case of the rare segment, about two-thirds of the print books are associated with the humanities, while 18 percent can be assigned to the social sciences and 16 percent to STEM. In contrast, half of the materials in the core segment correspond to the humanities, 30 percent to the social sciences, and 20 percent to STEM.



Malpas and Lavoie, for OCLC Research. 2014.

Figure 9. Broad subject breakdown of the rare and core segments of the CIC collective print book collection

Figure 9 shows the same subject breakdown for the collective CIC print book resource, revealing that at the consortial level the subject profile is virtually identical to that evidenced in OSU's local collection. Rare materials are highly likely to be humanities-focused, while core materials are divided evenly between the humanities and the social sciences/STEM. The results for the CIC rare segment are particularly interesting: the fact that these materials are categorized as rare indicates that they are not widely held, which in turn suggests divergent collecting practices across the CIC in regard to selecting specific publications. However, the fact that the subject distribution profile for the CIC rare segment is almost identical to that of OSU suggests that CIC members converge in collecting behaviors in terms of the broad allocation of publications across the three subject areas.

Final Note

The preceding analysis forms the beginnings of an emerging profile for rare and core print books at both the local and consortial levels. In the rare segment, a representative print book would likely be humanities-focused, probably a little older than the average print book in the collection, and have a high likelihood that its content is in a language other than English. For the core segment, there is an even chance that a representative book will be related to the

humanities or the social sciences/STEM; the book will likely be a little more recent compared to the average book in the collection; and its content will almost certainly be in English. An interesting feature of these profiles is that they are consistent at both the local and consortial scales.

While these profiles represent only a “stick figure” view of the rare and core materials in the OSU and CIC collections, they are a useful first step toward characterizing areas of convergence and divergence in local and consortium-wide collecting decisions. A deep understanding of the relative size and characteristics of the rare and core segments will likely be critical in deciding which materials should be managed locally, and which should be managed above the institution—especially to the extent that they illuminate the kinds of print books associated with the most distinctive local collecting decisions, and those associated with the areas of heaviest collective investment across the consortial membership.

III. Centers of Distinction

The analysis in the previous section explored the size and characteristics of the rare and core segments of the OSU and CIC print book collections. The boundaries of these categories were determined on the basis of how widely held a particular print book publication is across the CIC membership. In this section, we employ a different approach to measuring distinctiveness that focuses not on rates of duplication, but on a comparison of the relative strength of institutional holdings in various topical areas, and an assessment of how comprehensive those collections are when compared to the published literature.

Library “centers” are identified by clustering publications in the WorldCat bibliographic database by FAST (subject)⁵ and VIAF (personal name)⁶ identifiers, and then sorting the clusters by the size of related holdings represented by individual OCLC library symbols. This produces a data set that reveals which libraries hold the largest collections, measured by title count, of materials related to individual subjects and identities. A further refinement of this technique computes the number of works (in the FRBR understanding of this term, i.e. creative works embodied in a discrete expression) related to each FAST and VIAF heading, providing a context against which the relative comprehensiveness of institutional holdings can be judged.

We used a data set produced in May 2013 to identify the top 50 most comprehensive subject-based collections in each of the thirteen CIC libraries included in our study. These clusters were then compared across the consortium to identify areas where multiple CIC libraries hold broad collections of related resources, reflecting shared patterns of institutional investment. Figure 10 shows the size of and scope of these “shared centers” based on the number of libraries and topics. It reveals that there are relatively few topical areas in which more than one or two CIC libraries have significantly large or comprehensive collections. Indeed, almost 60 percent of the 50 most comprehensive topical collections in each library are associated with a single CIC partner. Put another way, the collective scope of CIC institutional collections is much broader than the scope of any individual collection. This is consistent with a key insight that emerged in our analysis of the CIC print book landscape, the observation that *scale adds scope and depth*.

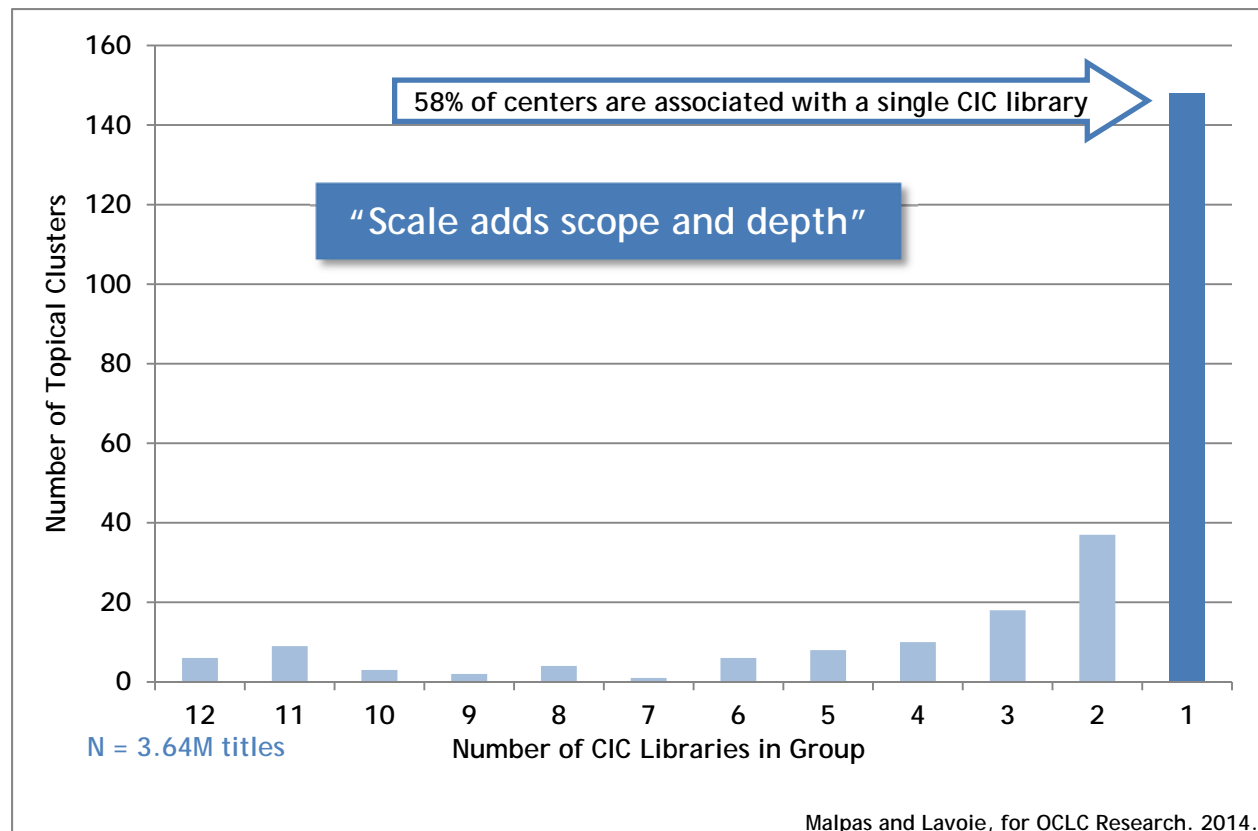


Figure 10. Number and size of shared centers (based on top 50 centers for 13 CIC libraries)

Understanding the distribution of centers across the CIC provides useful insights into the operational implications of shared print management and the optimal scale for stewardship of different classes of material. Institutions with library collections that offer the best available coverage of particular subjects and authors are likely to regard them as distinctive institutional assets, appropriate for continued institution-scale investment. Thus, one can imagine a distributed stewardship arrangement in which individual CIC libraries commit to preserve locally distinctive resources on behalf of the larger group. Conversely, where there is evidence of shared investment in certain subjects, there may be opportunity for coordinated stewardship that results in rationalization and de-duplication of local holdings. The shared centers profile throws into sharp relief the distinctive contours of individual CIC libraries, as well as the richness of the collective resource—considered not just in terms of scarcity or duplication in holdings, but also in terms of disciplinary specialization.

Using the centers and coverage data, it is possible to explore a range of shared print scenarios based on actual collection profiles. Here, we will explore two scenarios: an institution-scale approach using OSU Libraries as an example, and a group-scale approach using OSU and several other CIC libraries.

Table 4. OSU library centers of distinction

FAST heading	OSU coverage compared to WorldCat	Heading	OSU Rank compared to other WorldCat libraries	OSU Rank compared to other CIC libraries
fst01008312	67%	Manuscripts, Church Slavic	1	1
fst00848081	61%	Cartoonists	1	1
fst00980348	60%	Israeli poetry	4	1
fst00807464	44%	American wit and humor, Pictorial	1	1
fst00954398	37%	Hebrew poetry	13	1
fst01205076	33%	Ohio—Columbus	1	1
fst00812274	30%	Arabic fiction	10	2
fst01108635	27%	Science fiction, American	11	1
fst00812533	24%	Arabic poetry	13	2
fst00869145	20%	Comic books, strips, etc.	1	1

Table 4 presents a list of ten subject areas for which OSU's library holdings are especially strong. These represent areas where OSU's investments in library acquisitions and resource description have resulted in comparatively strong coverage of the relevant literature. Not surprisingly, the list includes several highly specialized topics, for which the corpus of materials available to libraries is relatively small, compared to more general topics. For instance, there are only about two thousand works in WorldCat that are related to Church Slavic Manuscripts (fst01008312), while there are more than 17 thousand related to the Orthodox Eastern Church (fst00510210). It is nonetheless significant that OSU has very strong holdings in this area, since the university is recognized as a leading center for Eastern European studies and has the distinction of having served as a National Resource Center under the provisions of the United States Department of Education Title VI program since 1965. Likewise, the strength of the library's collections related to Middle Eastern poetry and fiction are likely a reflection of the university's deliberate investments in supporting this area of study, for which it is also a National Resource Center.

While some "centers" in the OSU library collection reflect long-standing areas of institutional expertise, for which library materials have been acquired over many years to support teaching and learning, others represent special collections originally acquired as gifts to the library, around which centers of scholarship were then created. Three of the ten subject headings in table 4 relate to comic and cartoon art, and OSU's broad coverage of this area is due in large part to a singular gift of materials from an alumnus in 1977, which formed the seed of what is now the nationally famous Billy Ireland Cartoon Library and Museum. Whether library centers emerge organically from ongoing acquisition to support existing programs or are introduced into the library system through some external agency (as with the gift of a sizeable personal collection), they provide useful evidence for assessing the alignment of library holdings with institutional priorities and value.

In the context of shared print planning, library centers have additional value as guideposts for identifying topically-related collections that may be suitable for either continued local stewardship (as in cases where the materials support a high-priority area of institutional research or teaching, or otherwise contribute to institutional reputation), or which might benefit from cooperative stewardship. In some instances, library centers may even be helpful in identifying local collections that are “coherent” from a research perspective but are no longer closely aligned with the parent institution’s mission or mandate. In such cases, centers may provide insights to support sensible collection transfer decisions.

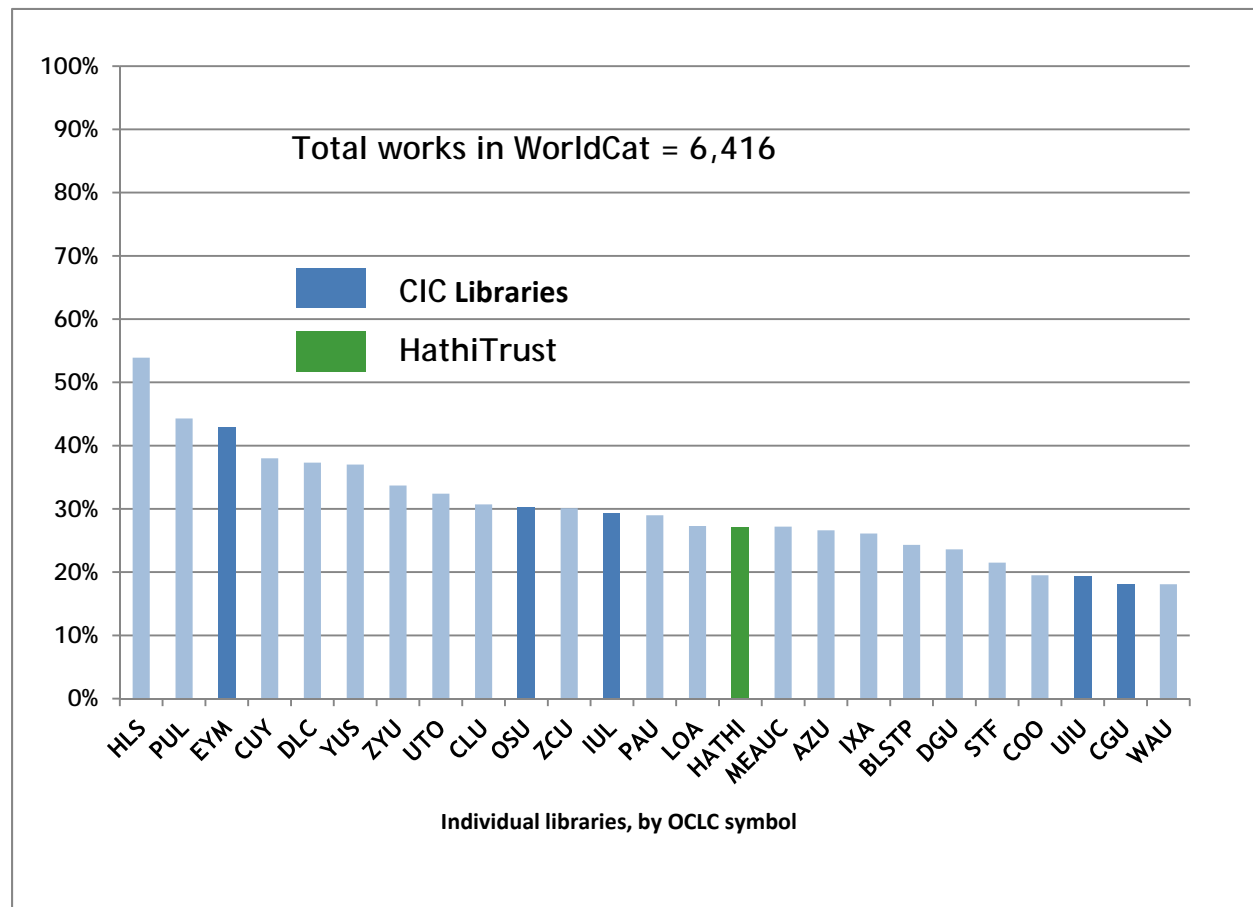
Beyond highlighting centers of distinction within institutional collections, our analysis of CIC library centers also reveals an important feature of the broader library landscape: the remarkable diffusion of topically related material across many libraries. Looking again at table 4, we see that even in topical areas for which OSU offer the best coverage, local holdings are far from comprehensive. For example, “Comic books, strips, etc.” (fst00869145) are clearly a major strength of OSU’s collection—the library ranks first within both the CIC and WorldCat as a whole—and yet, local holdings amount to about a fifth of the related literature in WorldCat. This illustrates another of the key insights from our analysis of the print book landscape, viz., *coverage requires collaboration*. Among the top ten most comprehensive topical collections held by OSU, only three provide coverage of 50 percent or more of the related titles in WorldCat. If the breadth of OSU’s holdings in these areas was to erode, it would clearly have an impact on the coherence of the system-wide collection; by the same token, even a commitment to preserve every related title at OSU would fall far short of ensuring preservation of the corpus as a whole. In short, cooperative stewardship arrangements will likely be needed to ensure long-term preservation of these resources.

If we look at the distribution of subject-based centers across the CIC as a group, we can see patterns of collecting activity that are shared across the consortium. While these shared collecting patterns are most prevalent at the relatively small scale of two CIC institutions, they also hold across larger groups (figure 9). Table 5 lists some examples of shared centers of collection strength across the CIC. As one might expect, the subject areas that are widely collected by many CIC institutions are more general in focus, while those collected by a smaller number relate to more specialized areas of study. Thus, while nearly all CIC libraries have relatively comprehensive holdings related to International Relations, materials related to South Asia are collected primarily by the University of Chicago and the University of Wisconsin, Madison.

Table 5. Examples of shared CIC library centers

Subject Area	Number of CIC Centers	CIC Libraries
International Relations	12	[all but Purdue]
Women and Literature	12	[all but Purdue]
Social History	11	[all but Purdue and University of Nebraska]
Developing Countries	8	Illinois, Indiana, Iowa, Michigan State, Minnesota, Northwestern, Penn State, University of Wisconsin-Madison
Soil Surveys	4	Minnesota, Nebraska, Penn State, Purdue
Russian Literature	4	Chicago, Indiana, OSU, UIUC
Nepal	2	Chicago, University of Wisconsin-Madison
Hindi Poetry	2	Chicago, University of Wisconsin-Madison
Pakistan	2	Chicago, University of Wisconsin-Madison
Zimbabwe	2	Northwestern, Michigan State
Ethiopia	2	Northwestern, Michigan State

Of course, collection interests that are shared within the CIC will also be shared across the wider library system. Returning to one of the subjects for which OSU's collections are especially strong, we will consider the example of Arabic fiction. This is a subject strength that reflects OSU's deliberate efforts to develop language-based collections to support scholarship in Middle Eastern studies. Other CIC institutions have distinguished academic programs in this area and correspondingly rich library collections, and so do other research institutions. Figure 11 provides a view of the top 25 most comprehensive library collections in WorldCat related to Arabic fiction. Each column in the chart represents a single library (WorldCat symbol). Five of the most comprehensive collections, including OSU, are held by CIC institutions. The single most comprehensive collection is held by Harvard University (HLS), which provides coverage of nearly 54% of the related literature in WorldCat. Coverage within the CIC ranges from 18% at the University of Chicago (CGU) to 43% at the University of Michigan (EYM). Clearly, the collective CIC resource represents a major share of the system-wide library collection related to Arabic fiction. And this collective strength is also reflected in the strength of the HathiTrust Digital Library's holdings on this topic, since CIC members—Michigan and Indiana especially—have contributed related content to the shared digital archive.



Malpas and Lavoie, for OCLC Research. 2014.

Figure 11. Top 25 most comprehensive collections related to Arabic fiction (Total works in WorldCat = 6,416)



While these examples are obviously insufficient to develop a complete picture of CIC collecting patterns, they do suggest distinctive patterns of convergence and divergence that might guide shared print planning efforts within the consortium. Shared collection centers provide a natural starting point for establishing or deepening “above the institution” management strategies, whether these operate at the scale of two or three institutions, or across the entire consortium. They are equally valuable in identifying topically related clusters of local holdings that represent important institutional differentiators (as in the example of comic strip art at OSU). And, as the examples above illustrate, the scope and distribution of library centers provide compelling evidence that cooperative stewardship arrangements will be important to preserving coherence in the collective library resource, since even very large institutional collections provide relatively limited coverage of the relevant literature.

Demand for CIC Print Books

Understanding the size, scope and distinctive characteristics of the collective CIC print book resource is a necessary first step in planning for future shared print management strategies. These are important components of a supply-side profile. To “right-scale” any cooperative stewardship arrangement, i.e., to optimize the scale at which shared management is operationalized, it is also important to understand the demand-side dynamics of how the aggregate resource is actually used. A detailed analysis of local circulation statistics for individual CIC libraries was beyond the scope of the present study. Moreover, a prior analysis of library circulation patterns in the OhioLINK consortium examined circulation of print books in the OSU library within a large, group-scale context and established a baseline understanding of which monographic materials are most in demand (OhioLINK Collection Building Task Force, Gammon and O’Neill 2011). To gauge system-wide demand for print books held by CIC libraries, we turned to a different source: historical inter-lending patterns. Because all CIC to CIC inter-lending activity passes through the OCLC WorldCat Resource Sharing (WCRS) system, the WCRS transaction archive provides a rich source of data for exploring longitudinal demand patterns.

Using the same set of OCLC library symbols from which our analysis of the CIC print book collection was derived, we compiled a dataset comprising approximately 2.5 million CIC borrowing and lending transactions registered over a period of seven years (2007-2013). We limited our analysis to “returnable” borrowing and lending activity in order to eliminate document supply transactions, which are typically fulfilled by photocopy or digital scan and hence require no round-trip of physical inventory. While returnable lending includes some non-book formats (video-recordings, DVDs, microfilms, etc.), the vast majority of activity is associated with monographic titles. Table 6 provides a high-level statistical summary of the in-bound and out-bound transaction activity.

Table 6. CIC Inbound and Outbound Returnable Requests (2006-2013)

 CIC Borrowing	 CIC Lending
<ul style="list-style-type: none"> • 1,215,831 requests • 801,700 titles borrowed • 84% books • 5,160 libraries (symbols) filled requests from 29 CIC libraries 	<ul style="list-style-type: none"> • 1,330,831 requests • 888,996 titles loaned • 90% books • 29 CIC libraries (symbols) filled requests from 5,266 libraries
Descriptive Statistics	

<ul style="list-style-type: none"> • Average requests per title: 1.45 • Average holdings per title: 138 (median = 44) 	<ul style="list-style-type: none"> • Average requests per title: 1.43 • Average holdings per title: 128 (median = 43)
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A key finding of this analysis is that CIC libraries supply (and are supplied by) a large number of inter-lending partners. Over the seven year time period we examined, CIC libraries filled requests from more than five thousand borrowers and requested materials from an equally large population. This is all the more remarkable given that the WCRS transaction archive represents a fraction of total CIC lending and borrowing activity, and it serves as important reminder of the fact that the CIC is embedded in a much larger resource-sharing economy. To the extent that non-CIC libraries rely on CIC suppliers for access to print books, disruptions or changes in the organization and availability of CIC inventory may have impacts well beyond the consortium. We will look more closely at non-CIC borrowers and suppliers of print books in a subsequent section of this report.

Another important finding that emerged from our analysis is the relatively diffuse demand for print book titles, i.e., the fact that average borrowing and lending transactions per title were low even over a fairly long period of seven years. On average, titles loaned or borrowed by CIC institutions were requested fewer than two times over seven years. Of course, it is possible that if borrowing and lending activity that passed through non-WCRS channels were included in our analysis, we would find a higher rate of repeat demand. But it is equally possible that increasing the pool of transactions would simply expand the range of titles borrowed and loaned, so that no additional concentration of demand would be apparent.

Equally interesting is the discovery that a relatively small part of the collective CIC resource—fewer than 900,000 titles, or about 7% of the aggregate print book collection—were loaned by CIC libraries. A roughly equal number of titles were borrowed by CIC institutions. One might be tempted to infer from this that the titles borrowed and loaned represent content that is difficult to find or obtain, i.e., books that are relatively rare in the library system. But the evidence does not support this hypothesis, since both the median and average holdings per requested title are fairly high. On average, requested titles are held by more than 125 libraries. This raises a host of interesting questions about the alignment of supply and demand. For instance, one would want to know if “core” titles that are borrowed or loaned by CIC libraries are not held by the requester (even if they are held by many other libraries), or if they are simply not available at the time of the request. Similarly, it would be important to know if titles supplied by non-CIC institutions are held elsewhere within the CIC system, i.e. are not held locally but might have been supplied by a CIC partner. We will return to some of these questions further on.

We have observed that titles requested from, and borrowed by, CIC libraries are comparatively abundant in the wider library system. Figure 12 measures the total holdings of

titles loaned by the CIC at two different scales. It provides a stark illustration of our key insight that *scarcity is relative*. The top bar shows that a relatively small proportion (12%) of the titles loaned by CIC libraries are scarce or rare, defined here as being held by fewer than five libraries.⁷ By contrast, if we assess scarcity at the scale of the CIC, we find that 63% of titles are held by fewer than five CIC members. While this finding is not especially surprising—we have already established that three-quarters of the CIC print book resource is held by 3 or fewer CIC libraries—it is significant, for it suggests that a shared print management strategy that focuses on titles that are “rare” at group scale will need to take into consideration the external (i.e., non-CIC) demand profile for those titles. One potential implication is that a dark archiving strategy is not a good fit for these apparently scarce titles, unless the CIC is prepared to see its inter-lending supply activity decrease.

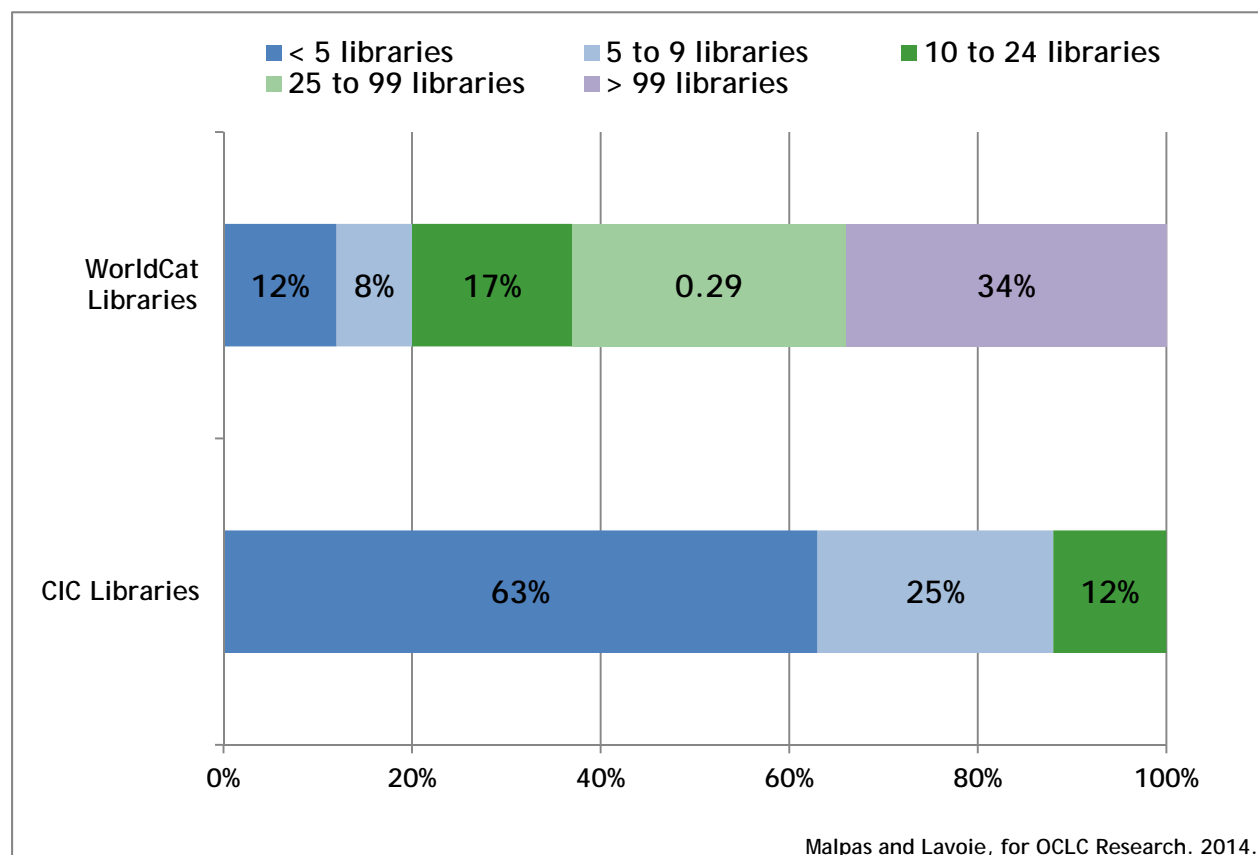


Figure 12. Group and system-wide supply for titles requested from CIC libraries

In thinking about future print management scenarios, it is important to recognize that the CIC plays an important role in fulfilling network demand for print books, whether the network in question is defined by membership in the CIC or by participation in other inter-lending partnerships. It is equally important to acknowledge that while CIC libraries serve a national and even global clientele of borrowers, a significant part of the demand it meets is

concentrated within the Midwest region of the United States and more specifically within the CHI-PITTS mega-region.



Figure 13. Geographic distribution of requesting institutions

Figure 13 shows the geographic distribution of institutions that requested titles from CIC libraries during the seven year period we studied. It usefully highlights the remarkable geographic range that CIC print books (and other returnables) traveled between 2007 and 2013. One cannot help but wonder if the cost of transporting a physical volume to and from distant locales was strictly necessary, given our finding that most of the requested titles are relatively abundant in the larger library system. We will return to this question. Here, we are interested in different aspect of the demand profile for CIC resources, specifically the importance of the CIC print book resource to the regional resource-sharing economy of the Midwest. While just 38% of the libraries that placed returnable requests with CIC libraries are located in the CHI-PITTS mega-region, their total demand accounts for more than half of the request transactions filled by CIC partners. The heavy concentration of CIC institutions in the CHI-PITTS catchment zone is not enough to account for the skew in this distribution; rather, it is the case that CIC institutions are supplying the materials to many non-CIC institutions that are geographically co-located in this mega-region.

From a shared print planning perspective, this distribution pattern suggests that it will be important for CIC libraries to consider how reliant Midwest (and especially CHI-PITTS) institutions are on the CIC print book supply chain. As an example, one might ask if participants in the Michigan Shared Print Initiative (MI-SPI), which seeks to maximize space recovery among partner libraries through selective de-duplication in monographic holdings, are relying on an assumption that larger institutions like the University of Michigan and Michigan State University (both CIC members) will continue to hold and to supply print books for the long term.⁸

This leads to an observation that amounts to a fourth key insight, i.e., that *distributed curation requires deliberate coordination* among interested partners. Put simply, the CIC print book collection cannot be fully understood, or effectively managed, in isolation from other systems in which it is embedded.

We have established that the CIC print book resource supports many thousands of libraries. We have further observed that CIC libraries themselves borrow from thousands of non-CIC libraries. This is arguably a surprising finding, given the very broad scope of the collective CIC print book resource. Recall that the 13 CIC libraries in our study hold almost 12.5 million print book publications, or about a quarter of the titles held in North America. Figure 14 provides a high-level view of the sources from which CIC libraries borrow material, distinguishing between lenders within and outside the consortium. Of the 1.2 million returnable requests placed by CIC libraries, more than half (57%) were filled by non-CIC libraries.

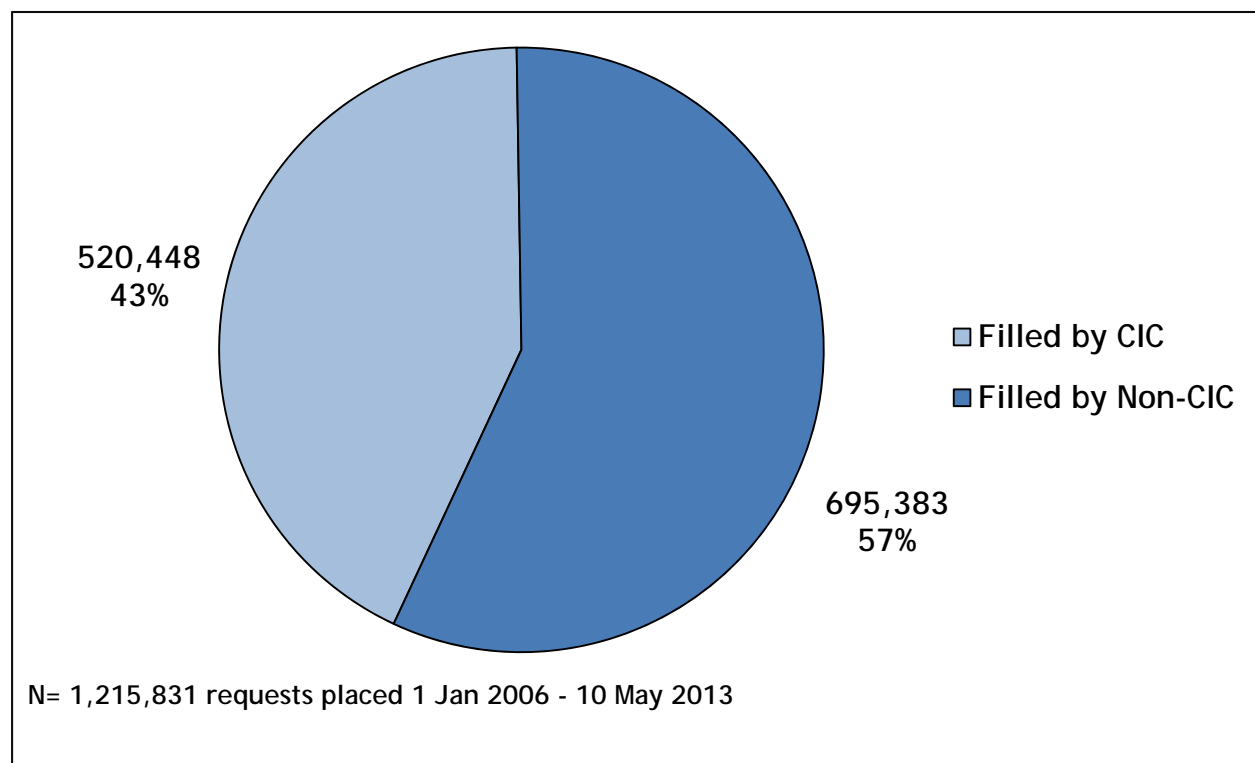


Figure 14. CIC returnable borrowing requests by source of fulfillment

Malpas and Lavoie, for OCLC Research. 2014.

As noted above, our data on CIC inter-lending is incomplete and so we are unable to say with certainty what part of total CIC demand is met by non-CIC institutions but it is reasonable to think that it is more than 57%. What we can say is that the CIC fulfilled *no more than* 43% of CIC demand in the seven year period we examined. Does this mean that the CIC collection, rich and varied as it is, is insufficiently broad to meet the needs of the students, researchers and faculty it serves? Or does it instead reveal that the relative scarcity of in-group holdings within the CIC is causing demand to be directed to other lending partners? A third possibility is that it is sometimes preferable to borrow from non-CIC lenders, because their resources are easier to find, can be provisioned more efficiently (at lower cost, with greater speed), or because a non-CIC lending partnership is prioritized in the lending queue.

To explore this issue more deeply, we examined the 800 thousand titles that CIC libraries borrowed to see if they are currently held within the consortium. It was not feasible to compare the profile of titles borrowed and held within the consortium for each of the seven years in the time horizon we examined; instead, we compared the titles to CIC holdings as of June 2013. Figure 15 reports the outcome of this analysis. More than 500 thousand of the titles requested by CIC libraries (68%) are now held by one or more CIC libraries. Put another way, the CIC collective print collection is now sufficiently broad to meet more than two-thirds of the group's historical demand. This then raises the question of whether some "artificial" constraint in CIC discovery and delivery systems is creating obstacles to in-group fulfillment, or if requests are directed to non-CIC lenders because the requested title is already in circulation.

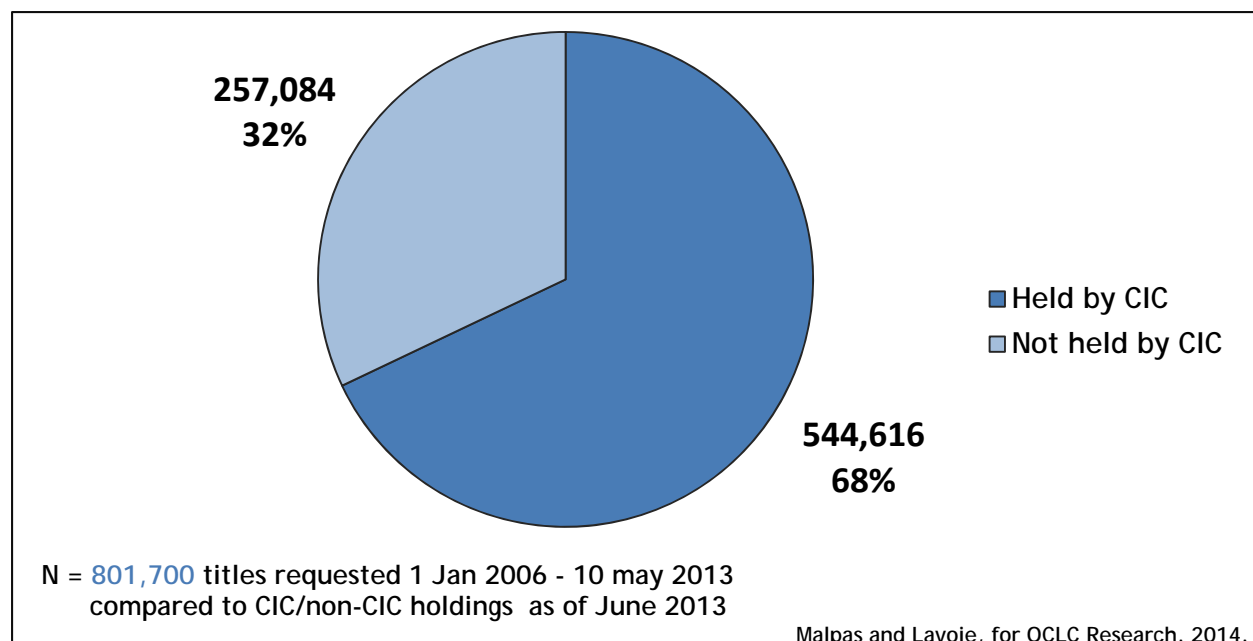


Figure 15. CIC Returnable Borrowing—Requested titles held by CIC libraries vs. non-CIC libraries

In 2011, six CIC libraries implemented a consortial borrowing system (UBorrow) that has been heralded as a major achievement in resource-sharing and is now in use across the entire group. Individual CIC members have reported that an increasing share of borrowing activity now passes through the UBorrow system, resulting in higher in-group fulfillment rates. The shared discovery and delivery system, which includes an optional “unmediated” patron interface, functions as a load-leveler, distributing demand more efficiently across the CIC. In 2013, the University of Chicago, one of the original implementers, reported that “popularity of the new service led to a 30 percent decrease in the number of items recalled from UChicago Library users ... suggesting that many are choosing not to inconvenience UChicago borrowers when copies can be easily obtained through UBorrow.” We were interested to consider if the impact of UBorrow implementation would be visible in the WCRS transaction archive.

We compared the volume of CIC request activity that was met within and outside the group before and after the UBorrow pilot (2011) and broader implementation (2012). Figure 16 reports the result of this analysis.

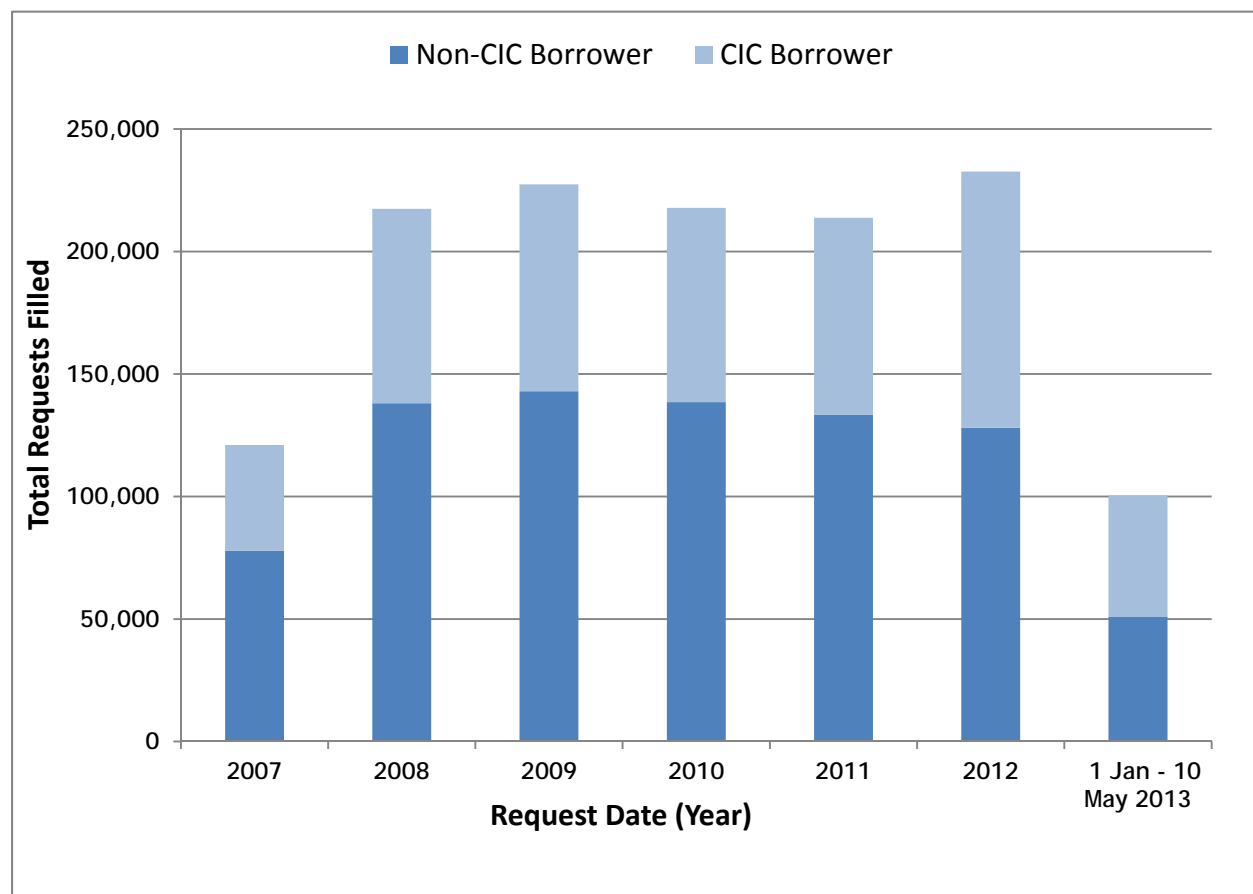


Figure 16. Returnable requests filled by CIC libraries, 2007-2013

Our findings are consistent with what individual CIC libraries have reported, i.e. in-group fulfillment has increased since the UBorrow program was launched. Indeed, it appears that the implementation of this resource-sharing system coincides with an increase in total CIC lending. Both of these trends are positive and suggest that the CIC is delivering increasing value both within and outside of its membership. One might anticipate that a more deliberate approach to coordinated management of the collective CIC print book resource will deliver comparable benefits: investments made in securing the long-term preservation of shared assets will be repaid in continued use and increased value (demand for) library collections. Taken in conjunction, the findings reported in figures 15 and 16 suggest that the carrying capacity of the CIC print book resource—that is, the demand that it can support—can be maximized through more effective disclosure and coordinated management.

HathiTrust

All CIC libraries are partners in the HathiTrust Digital Library, which provides a shared digital preservation and access repository and related services to a growing number of academic institutions. Given the significant investments that CIC libraries have made in developing this infrastructure, through both capital contributions (in the form of dues) and content contributions, it is reasonable to ask what role the shared digital repository might play in future shared print management scenarios. We have already observed, in the library centers analysis, that the scope of HathiTrust's digital collection rivals that of major research library collections. And, in a prior study, we established that the broad scope of HathiTrust is also reflected in the high degree of duplication between institution-scale library print collections (especially academic print book collections) and the digital aggregation (Malpas 2011). It stands to reason, then, that a substantial number of print books in the collective CIC collection are duplicated by HathiTrust. Could that duplication be leveraged to extend, or even displace, some part of the comparatively costly physical fulfillment currently supported through traditional inter-lending?

To answer this question, we compared HathiTrust coverage of the titles borrowed and loaned by CIC libraries, using a June 2013 snapshot of the HathiTrust collection. Figure 17 reports the outcome of this investigation. As anticipated, a substantial proportion of titles were duplicated. Almost 30 percent of titles loaned by CIC libraries have been digitized and preserved in the HathiTrust collection; the duplication rate is somewhat lower (20%) for titles borrowed by CIC libraries. This is not especially surprising when one considers that more than 30 percent of the titles borrowed by the CIC are *not* held within the consortium, and are hence somewhat less likely to have been contributed to the digital library. While the proportion of titles duplicated differs, the net yield of digitized material in the public domain is about the same: 3 percent of titles loaned versus 2 percent of titles borrowed. In

absolute terms, this relatively modest overlap is still significant. Consider, for example, that 14 thousand titles borrowed by CIC libraries and 28 thousand titles supplied by CIC libraries could—in principle—have been fulfilled at a much lower operational cost with full-text digital surrogates.

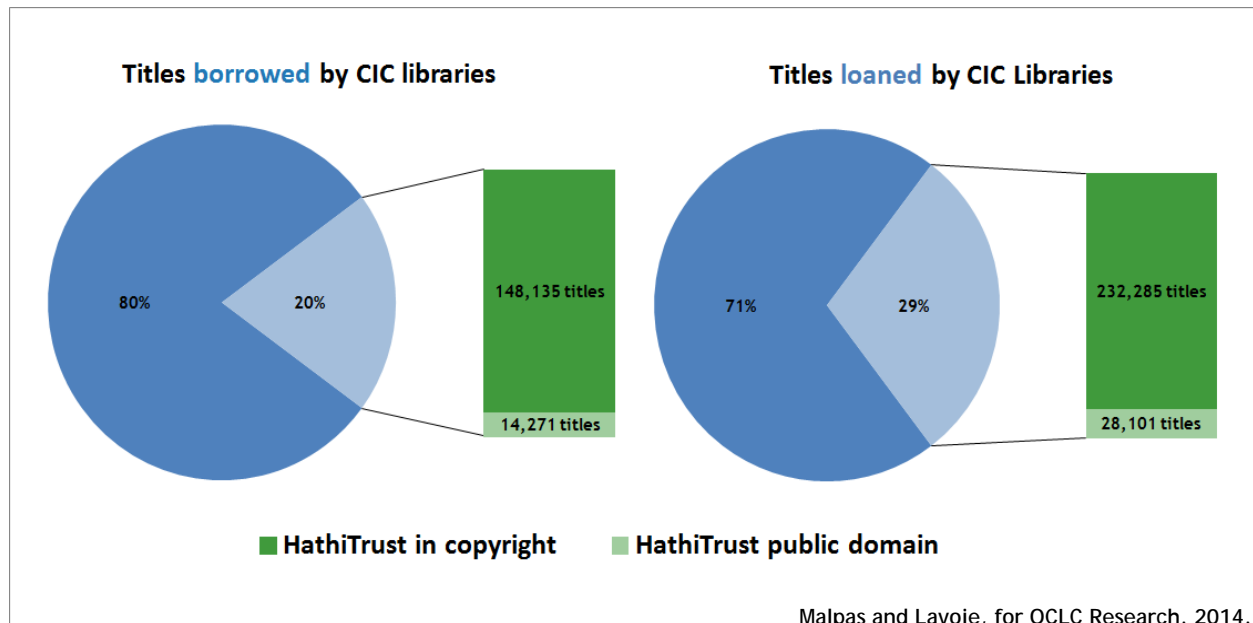


Figure 17. Alternative supply chain: HathiTrust

These are admittedly counterfactual arguments, since at least some of the demand pre-dated digitization of the requested titles. Moreover, it is far from certain that every request for a print book can be adequately fulfilled with a digital surrogate, though it seems likely that for purposes of reference-checking or for assessing general relevance, digital surrogates might actually be preferable to print. As HathiTrust partners, all CIC libraries benefit from access to downloadable versions of many public domain titles and could implement direct, print-on-demand fulfillment from the HathiTrust collection before resorting to more costly, traditional fulfillment mechanisms. In short, while digital surrogates can presently meet only a small part of (historical) demand for print books, it is clear that the HathiTrust library could be leveraged by CIC institutions to reduce the operational costs of inter-lending.

There is a further option that CIC libraries might exercise to maximize the value of HathiTrust as an alternative supply chain for library inter-lending, and that is to prioritize the digitization of public domain titles in the CIC collection in anticipation of future demand, or upon request. But, given what we have seen about the relatively small part of the aggregate print book collection for which inter-lending demand is expressed in term of request activity (allowing for the fact that we are examining only a part of the global inter-lending trade), and the comparatively low rate of repeat demand, it is not obvious that

this collection development strategy would be any more productive than the *ad hoc* contribution model that is currently in place. A larger implication is that a HathiTrust effort to secure a print replica of the digital library—a print “mirror” of the digital aggregation—could create a new supply hub for up to a fifth of CIC inter-lending demand. This would obviously require that the HathiTrust print archive function as a service collection, rather than a dark archive. A HathiTrust working group (including some CIC institutions) is currently exploring a variety of options for extending the partnerships efforts into shared print as well as shared digital activities.

IV. Key Findings and Implications

The analysis of the OSU print book collection and the CIC collective print book resource yields an assortment of general themes and more specific findings that shape important context around the development of a cooperative print strategy at both local- and group-scale. In this section, we revisit the three general themes derived from our view of the print book landscape discussed earlier in the report, and recapitulate the manifestation of these themes in the OSU/CIC analysis. We then enumerate a set of additional findings which, although derived from the specific circumstances of the OSU and CIC print collections, nevertheless provide useful insight into other cooperative print management contexts.

Revisiting the General Themes

In our discussion of the print book landscape at the beginning of the report, we highlighted three key themes that seemed to emerge from this multi-scale view of system-wide print book holdings: scale adds scope and depth; uniqueness or scarcity is relative; and coverage requires collaboration. While these insights are evident from the extremely high-level view of print book holdings provided by the print book landscape in figure 1, they can be discerned in sharper relief in the context of the findings which emerge from our analysis focusing on the OSU and CIC print book collections.

Scale Adds Scope and Depth

Examining print book holdings at both the local and group scale highlighted the finding that aggregation quickly builds up the “long tail” of a collective print book resource. This insight is illustrated quite vividly in comparing the rare segments of the OSU and CIC print book collections. While a substantial portion (38 percent) of OSU’s collection is accounted for by these materials, an even greater proportion of the CIC collective print book resource (76 percent) falls into this category (figures 2 and 3). The key point is that the long tail of the collection scales up quickly as the scale of aggregation increases. The rare segment of the CIC collective collection is nearly 25 times larger than the core segment, suggesting a print book resource characterized by a relatively small nucleus of about 400,000 widely-held materials surrounded by a deep layer (approximately 9.4 million distinct publications) of comparatively rare or scarce materials. This deep layer, emerging from the aggregation of the CIC membership’s local print book holdings into a group-scale resource, is a rich complement to any single CIC member’s local print book collection.

The impact of scale on scope and depth is seen in other aspects of the OSU/CIC analysis. For example, in our examination of the rare segments of the OSU and CIC collections, we saw that the range of languages other than English represented in the rare segment of the CIC collection print book resource was nearly twice as wide (458 compared to 236) as that in the rare segment of the OSU collection (figures 4 and 5). Additionally, the “centers” analysis found that individual CIC collections exhibit a variety of distinctive collecting strengths, as well as a number of shared strengths across multiple institutions. These strengths also add to the scope and depth of the collective print resource when aggregated across the CIC membership. The effect is amplified by the fact that relatively few topical “centers” are shared by multiple institutions (figure 9). Therefore, aggregating over all collections broadens the range of distinctive collecting strengths exhibited in the collective print book resource.

Uniqueness or Scarcity is Relative

The degree of distinctiveness of a particular print book resource is not intrinsic to the resource itself, but instead depends on the frame of reference in which it is placed. This idea is clearly at work in the context of the OSU local print book collection, where we saw that no single CIC member’s collection could account for more than half of OSU’s collection, but the CIC membership as a whole could account for more than 80%. Extending the geographical scale to the regional level, we found that 90 percent of OSU’s print book holdings were available somewhere within the CHI-PITTS region. As these findings show, the “distinctiveness” associated with OSU’s print book collection varied with scale: on a local scale, bi-lateral comparisons with other CIC members’ collections suggested that OSU’s print book holdings were quite distinct; conversely, when the comparison is elevated to a higher scale—e.g., consortial or regional—the degree of distinctiveness, at least as measured by unique holdings, drops dramatically.

Similar effects are observed in the inter-lending data associated with the CIC collective print book resource. For example, the ILL data indicated that while nearly two-thirds of the materials loaned by CIC institutions through OCLC’s WCRS system were relatively scarce within the context of the CIC consortium—i.e., were held by fewer than five members—only 12 percent could still be considered scarce by the same definition when the frame of reference is elevated to the library system as a whole (figure 12). In this sense, while the majority of CIC loan traffic through WCRS appears to be for relatively rare materials within CIC collections, most of these materials are in fact available from many alternative (non-CIC) suppliers across the library system. Knowledge that these materials, which account for the majority of historical WCRS demand for CIC returnables, are obtainable from many other (non-CIC) sources would usefully inform print retention decisions within the CIC.

Coverage Requires Collaboration

No institutional collection is an island: even the largest collections represent but a fraction of the materials available within a group-scale resource. We saw this clearly in the case of the OSU local print book collection, which accounted for little more than 20 percent of the distinct print book publications available in the CIC collective print book resource (figure 1). Even the largest CIC print book collection—that of University of Chicago—only accounts for a third of the print book publications available across the CIC membership. But the print book landscape also shows us that even group-scale collections like CIC are subsumed within collective resources aggregated at larger scales: the collective print book resource of the CHI-PITTS region (in which most of the CIC membership is located) is about 50 percent larger than that of the CIC; the North American print book resource is one-and-a-half times larger than the CHI-PITTS resource; and the global print book resource is about three times larger than the North American resource.

This same phenomenon can be seen in subject areas where particular institutions (or groups of institutions) collect intensively. Our analysis shows that coverage of the complete literature in a particular subject area within institutional “centers of distinction” can be quite low. Table 4 illustrates this in context of the OSU collection, where the highest level of coverage for an OSU center—“Manuscripts, Church Slavic”—is about two-thirds. Other centers associated with the OSU collection exhibit much lower percentages: for example, coverage pertaining to “Ohio—Columbus,” a distinctive collection strength for which OSU is ranked first in coverage in the CIC, as well as WorldCat as a whole, extends to only 33 percent of the published literature on this topic.

As these findings show, managing, providing access to, and preserving the collective print book resource must be a shared responsibility, because no single institutional collection (or even group-scale resource) has a reasonable approximation of the complete corpus of material, either overall or in any particular subject area. This point is reflected in the finding that despite the vast scope and depth of the CIC collective print book collection, CIC demand is still partially served through WCRS inter-lending with thousands of libraries across North America and the world. Similarly, the CIC itself partially serves the demand of thousands of libraries world-wide. While some of the WCRS inter-lending activity into and out of the CIC may be for reasons like load-leveling and the intermittent availability of local copies, and while it is true that the volume of this ILL activity is relatively low, the flow of materials across institutions also hints at an interconnectedness based on the fact that no collection holds everything, and therefore coverage must be achieved through collaboration. Collaboration on the supply side (e.g., cooperative print retention and preservation) and on the demand side (e.g., inter-lending networks) can occur on a variety of scales, and be motivated by geographical proximity, shared collection strengths and priorities, and existing partnerships.

These three themes—scale adds scope and depth; uniqueness or scarcity is relative; and coverage requires collaboration—are important factors shaping the development of shared print strategies, both within the CIC and elsewhere. While the specifics of how these themes manifest themselves will likely vary from context to context, they nevertheless provide a useful set of foundational principles to inform planning in any setting where some form of cooperative print management is contemplated.

Additional Findings

In this section, we present some additional findings from our analysis of the OSU local print book collection and the CIC collective print book resource. In contrast to the general themes discussed in the last section, these findings are more firmly rooted in the OSU/CIC experience, and therefore their implications or relevance to other settings may be less direct. However, it is our belief that others beyond the CIC will also find some or all of these results—as well as the patterns of analysis from which they were derived—informative in regard to their own cooperative print management context.

Uniqueness is Rare, but Rareness is Common.

- As table 3 shows, more than 80 percent of OSU's print book holdings are duplicated by at least one other CIC member; even three-quarters of the largest CIC print book collection (University of Chicago) can be found elsewhere in the collections of other CIC members, while more than 90 percent of the smallest collection (Purdue) is duplicated by other CIC members. This finding demonstrates that a relatively small portion of CIC print book collections represent materials that are truly unique, in the sense that they are held exclusively by a single CIC member. However, we also saw that "rareness is common": more than three-quarters of the CIC collective print book resource is held by 3 or fewer CIC members. Thus, while materials held exclusively by a single CIC institution are rare, materials held by only a small subset of the CIC membership are common.

There is No "Archetypal" CIC Print Book Collection.

- The data reported in tables 1 and 2 indicate that CIC print book collections are not identical, but in fact differ significantly from one another when compared on a bi-lateral basis. We saw that no CIC print book collection can serve as a reasonable approximation of OSU's collection, and neither can OSU's print book collection stand in for that of any other CIC member. In short, there is no "archetypal" CIC print book collection. Rather, each institution contributes distinctive richness to the aggregate CIC print book resource.

A shared print strategy may be just as much about identifying and leveraging distinctive local and consortial strengths as it is about consolidation and reducing redundancy.

- The impetus for cooperative print management is often presented as the need to wring costs out of maintaining legacy investments in print. While this is certainly an important consideration, it is also important to recognize that another benefit from shared print is the opportunity to identify and disclose important differentiators across institutional collections. As we have seen (figures 2 and 3) at both the local (OSU) and consortial (CIC) levels, historical patterns of investment in print seem to favor “rare” or distinctive materials—that is, materials that are not widely held across the CIC membership. While a shared print strategy would identify and perhaps peel away a layer of widely-held materials from local collections, what remains may highlight or even reveal important distinctive strengths in each local collection. These strengths can in turn be leveraged into distinctive collections and services to support scholarly work in these areas, as well as to advance institutional research priorities.

Shared print strategies are likely to be formulated primarily around redundant materials and distinctive materials; understanding their respective characteristics is key.

- Much of the focus of a group-scale shared print strategy will likely be around materials that are on the one hand, widely duplicated, or on the other, relatively distinctive, across the participating institutions. As our analysis has shown, key parameters in identifying distinctive materials at the local and consortial level are rareness (measured by holdings) and subject coherence and coverage (measured by our “centers” and “comps” analysis). Our data provided nascent profiles of rare and core materials, and also a sense of some of the distinctive subject strengths within the CIC membership’s collections. The ability to draw clear boundaries between redundant and distinctive materials may help inform the organization of shared print strategies: rare materials and those comprising institutional “centers of distinction” may be a priority for local management, while core materials and those comprising multi-institutional “shared centers” may be candidates for collective management within some form of shared stewardship infrastructure.

Print retention decisions taken at the local and consortial level will impact the broader library system.

- Decisions taken regarding the future disposition of the CIC collective print book resource occur in a broader system-wide context, and will potentially impact supply and demand patterns beyond the CIC membership. Our analysis of the WCRS inter-lending data found that CIC institutions served ILL requests from more than 5,000

libraries worldwide, suggesting that many libraries utilize CIC print holdings to fulfill some portion of local demand. Moreover, an unanswered question is the extent to which non-CIC members rely on CIC print retention as a backstop for their own print reduction efforts. These issues also move in the other direction: our data found that CIC WCRS borrowing requests were filled by over 5,000 libraries system-wide, and it remains to be seen how CIC will determine its responsibilities for long-term stewardship of both widely-held and relatively scarce print book titles. For example, would a CIC institution consider a strategy that relies on external (non-CIC) stewardship guarantees for “commodity” titles? The interconnectedness of supply and demand for print materials across the library system suggests most group-scale shared print strategies will need to assess the strength and scope of external partnerships in the context of internal print retention decision-making. Distributed management of the collective print book resource across the library system requires deliberate coordination among partners.

Distance is still an important factor shaping patterns of supply and demand for print resources.

- While many shared print initiatives are organized within the context of academic consortia like the CIC, a consortial shared print strategy would likely benefit from considering the broader regional print book resource and stakeholders that are geographically proximate to the consortium. In our analysis, we saw that 90 percent of OSU’s local print book holdings were also available at another institution within the CHI-PITTS region—that is to say, close by. Furthermore, the CHI-PITTS regional print book resource contains 7.9 million distinct print book publications not available in any CIC member’s collection. We also saw that 38 percent of the libraries placing WCRS returnable requests with CIC institutions were located in the CHI-PITTS region, and that these requests accounted for more than half of the filled requests met by the CIC membership. These findings highlight the key role of geographical proximity—regardless of consortial affiliation—in shared print discussions: in particular, they suggest that the availability of a nearby (regional) print book resource and partners can support or complement local and even consortial print strategies, both from a supply-side perspective (e.g., print retention decisions), and a demand-side perspective (e.g., fulfillment options). In this sense, regional cooperation, as well as consortial, might be an important element of “right-scaling” cooperative print management.

The value of a collective print book resource can be enhanced through more effective strategies for disclosure and delivery.

- In addition to reducing the costs of managing print collections, shared print strategies often seek to leverage more value out of the historical investment in

print resources. One way to do this is to increase the “accessible coverage” available to faculty and students of participating institutions, by removing the boundaries from local collections and enhancing access to the collective (group-scale) print resource through the expansion of cross-institutional inter-lending arrangements. As our print landscape in figure 1 illustrates, even the largest local print book collections house and manage only a fraction of the resource available at consortial, regional, North American, and of course, global scales. The amount of demand supported by a group-scale print resource can be maximized by removing frictions in the discovery-to-delivery process. Our analysis of the WCRS inter-lending data seemed to correlate an uptick in in-group fulfillment with the implementation of the CIC-wide UBorrow system, which streamlines consortial borrowing within the CIC (figure 16). Such inter-lending collaborations may need to expand to the international level if scholars are to have adequate access to the full range of resources relevant for their work: recent studies suggest that US institutions have not significantly increased their collecting of foreign-published materials, even as scholarly interest in these materials—and the incidence of multinational research collaborations—has increased.⁹

Digitized collections like HathiTrust can stand in for a significant portion of inter-lending returnables traffic—but copyright restrictions are a major obstacle.

- Another way to enhance access to the collective print resource is through digitized surrogates. CIC libraries have made significant investments in building the shared HathiTrust digital library, and it is natural to speculate how access to the HathiTrust corpus could function as an alternative path to access to the CIC collective print book resource. According to our analysis of CIC WCRS transactions, 30 percent of the titles that CIC libraries loaned and 20 percent of the titles CIC libraries borrowed are duplicated in HathiTrust (figure 17). This suggests that a substantial proportion of both inbound and outbound ILL activity on returnables within the CIC could be shifted to HathiTrust for fulfillment. However, only a fraction of these transactions (2 to 3 percent) involve titles in the public domain that presumably could be supplied without restriction. While the absolute number of transactions involving public domain materials is significant, only a small percentage of historical demand can be met with HathiTrust’s currently digitized content. This seems to strengthen the incentive for CIC libraries to selectively digitize and archive titles requested through ILL that are in the public domain. More broadly, it speaks to the need to explore opportunities to coordinate shared print strategies with other group-wide collective management initiatives.

Collecting activity within the CIC membership exhibits patterns of shared investment in broad subject areas, complemented by title-level diversity.

- Collecting practices on the part of individual CIC members exhibits several key points of convergence and divergence. As we saw, CIC members' print book collections are not identical, but in fact differ significantly when compared on a bilateral basis (tables 1 and 2). This cross-collection diversity is also seen at the consortial scale, where our analysis showed that more than three-quarters of the CIC collective print book resource is held by three or fewer institutions (figure 3). While CIC members' title-level selection decisions seem to diverge considerably (thereby extending both the scope and depth of the CIC collective collection), these individual collecting decisions nevertheless seem to be shaped by a number of high-level similarities. Specifically, we found that at both local (OSU) and consortial (CIC) level, the materials in the rare and core segments adhered to roughly identical profiles in terms of language of content, age, and broad subject focus. Put another way, while CIC institutions seem to collect the same *kinds* of materials, collecting decisions vary significantly when it comes to the selection of *individual* titles. This finding of group-scale conformity underpinned by local-scale diversity is an interesting feature of the CIC collective print book resource, and may be a common feature among other collective print resources as well.

V. Conclusion

The OSU and CIC print book collections present a rich case study for examining the local and consortial implications of cooperative print management. While some of the findings from our analysis of these collections undoubtedly are particular to the OSU/CIC setting, most will find broader application across a wide range of shared print contexts. The OSU/CIC analysis furnishes a set of empirically-derived principles which help to map the territory of cooperative print management. These principles can surely be refined and expanded through additional studies of other shared print contexts, but even so, the OSU/CIC experience yields many findings that can serve to inform strategic planning around shared print in the CIC and elsewhere.

If there is one principle that warrants special emphasis, it is that scale impacts nearly all the fundamental characteristics of a collective print resource and the cooperation needed to sustain it. As our findings indicate, scale shapes the scope and depth of the collective print resource; the degrees of redundancy and distinctiveness attached to that collective resource at both local and consortial level; and the scope of cooperation needed to achieve reasonable thresholds of coverage and access. In this sense, “right-scaling” stewardship of the collective print investment becomes the central question of any shared print strategy: in other words, determining which materials are best managed at the local level, which are best moved into some form of shared stewardship infrastructure “above the institution,” and as a corollary to this latter point, the appropriate scale at which collective management should take place.

This last question—the choice of scale at which to undertake cooperative print management initiatives—is, in a practical sense, a bounded variable. That is, the possible scale of cooperative management is to some extent pre-determined by external factors, including the availability of appropriate, established cooperative infrastructure. Most shared print initiatives—or explorations of shared print opportunities—are occurring within existing collaborative frameworks, in particular, academic consortia like the CIC, ASERL, and Orbis-Cascade. These consortia are regional in scale, but do not extend to other collecting institutions located in the region. However, our findings have suggested potential benefits from extending cooperation beyond the boundaries of the academic consortium to encompass other regional stakeholders. At present, there is a lack of existing cooperative infrastructure

to support a true regional-scale cooperative print management initiative, a finding we discuss at more length in an earlier study of regional-scale shared print (Lavoie, Malpas and Shipengrover, 2012). In that report, we observed that

“[t]he absence of a cooperative infrastructure that is fit-to-purpose for achieving an integrated regional print management strategy, or negotiating on behalf of regional partners, represents a significant constraint on the development of a system-wide, multi-regional preservation plan. It remains to be seen if existing organizational structures will adapt to serve the growing need for supra-institutional and supra-regional planning and governance, or if new organizations will be needed to bridge the gap between state- or province-level and larger-scale federal or national approaches to cooperative print management.” (56-57)

A key issue, then, may be how to build on an existing academic consortium in order to expand shared print cooperation into the surrounding region, as well as to include other stakeholders external to the consortium as needed. Assuming that building integrated regional-scale cooperative networks from the ground up is a non-starter, one can imagine instead cooperative frameworks that feature existing regional academic consortia as their backbone, but extend beyond these consortia to other regional stakeholders. The Western Regional Storage Trust, a distributed print journal management program that encompasses more than a hundred libraries, including several academic consortia, is organized along these lines and relies (for now) on central administrative support from a system-wide planning office at the University of California.¹⁰ Whether this or some other approach is eventually adopted, it is clear that the importance of scale in shaping the features of collective print book resources suggests that any shared print initiative would benefit from deep reflection on two questions: what is the right scale at which to organize cooperation, and how can an appropriate cooperative framework and infrastructure be put in place to support cooperation at the chosen scale? More work is needed to explore these questions.

Notes

1. More specifically, we equate a “book” with a language-based monograph.
2. Since the CIC membership is not completely subsumed within the CHI-PITTS region, it is not possible to measure the additional layer of print books available at the regional level vis-à-vis the consortial level by simply taking the raw difference between the totals for the two collective collections. As it turns out, about 11.1 million publications in the CHI-PITTS print book resource are duplicated in the CIC collection; about 7.9 million publications are available in CHI-PITTS, but not in the collections of the CIC membership; and about 1.3 million publications are available within the CIC collection, but not within the CHI-PITTS collection.
3. The segments roughly divide the CIC membership into quarters.
4. OSU core segment: 379,616 publications; CIC core segment: 402,969 publications.
5. Faceted Application of Subject Terminology (FAST) was developed by OCLC Research in collaboration with the Library of Congress. Further information about FAST is available here: <http://www.oclc.org/research/activities/fast.html?urlm=159754>.
6. The Virtual International Authority File (VIAF) is the product of a cooperative effort by OCLC Research and more than twenty national libraries. Further information about VIAF is available here: <http://www.oclc.org/viaf.en.html>.
7. Note that the measure of scarcity used in our demand-side analysis (fewer than five libraries) differs slightly from that used in the supply-side analysis of the print book landscape (libraries). This disparity is explained by the fact that in analyses of individual library holdings compared to WorldCat as a whole, OCLC Research typically uses the threshold of fewer than five holdings as a hallmark of distinctiveness or scarcity. In the context of the CIC analysis, where the population is much smaller, we applied a slightly different measure (three or fewer libraries). In order to align the measure of scarcity within and outside of the CIC, we fell back on the somewhat more generous definition of scarcity (fewer than five libraries) that we have used elsewhere.
8. The Michigan Shared Print Initiative is a cooperative effort launched in 2011 by the Midwest Collaborative for Library Services (MCLS) to enable university libraries to reduce redundant print inventory and reclaim space for other teaching and learning uses. MI-SPI libraries commit to retain selected monographic titles for a period of fifteen years. For more information see: http://www.mcls.org/cms/sitem.cfm/library_tools/mi-spi/.
9. See, for example, the work presented at the 2012 conference Global Dimensions of Scholarship and Research Libraries: A Forum on the Future (an event supported by a grant from The Andrew W. Mellon Foundation and co-sponsored by Duke and the Center for Research Libraries): http://www.crl.edu/Events/8478/conf_papers.
10. For further information about the Western Regional Storage Trust (WEST), see: <http://www.cdlib.org/services/west/about/>.

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ISBN: 1-55653-474-4
978-1-55653-474-4
1403/215337, OCLC