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The Social and Collaborative Nature of Entrepreneurship Scholarship: A Co-Citation and Perceptual Analysis

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This article explores the structure of the "metafield" of entrepreneurship in two related ways. First, author co-citation analysis establishes a collective view of the structure of the entrepreneurship literature as perceived by its research-active members. The co-citation frequencies of 78 prominent entrepreneurship researchers were analyzed using multivariate techniques. Cluster analysis and multidimensional scaling were used to explore the intellectual structure of entrepreneurship research by identifying groups of scholars whose work falls into similar areas. Factor analysis was then used to identify the underlying themes that characterize and define the field. Finally, the scholars within these nominal groupings were approached using individualized questionnaires to explore what social interactions might parallel, reflect, or underpin the intellectual ones. The study has given empirical support to a number of oft-quoted beliefs about entrepreneurship as a field of study, such as: (1) the occurrence of fragmentation from an early stage in its development; (2) that the difficulty of categorizing subfields unambiguously mirrors that in the metafield itself; (3) that there is a relative paucity of scholarship cited across—as opposed to within—these subfields; and (4) that there is evolution within the meta-field of national differences in the topics studied and citation patterns thereto. In addition, the study demonstrates that there are real and robust social and collaborative networks underlying the generation of the work which is cited jointly by third parties. The latter authors may be unaware of these networks. Equally, the co-cited authors, while recognizing overlapping interests, may have difficulty in categorizing this commonality in their contributions. Entrepreneurship research is shown to be very much a social activity, although this may be invisible to outsiders or novitiates.

Introduction

We are asked 'what do you do?' and we reply 'I'm a teacher of entrepreneurship' or 'I'm an entrepreneurship researcher.' Almost invariably this provokes the follow-up

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question 'What is entrepreneurship?' or 'What exactly do you do?' which asks us to define, explain and characterise our subject. This is not, it must be noted, a situation faced by others: for example pilots, teachers of physics, or students of medicine do not normally go through this question-and-answer session.

(Harrison & Leitch, 1996, p. 66)

Often, those questions that perplex Harrison and Leitch's students are asked by other management researchers, too—and even entrepreneurship scholars themselves may hold very different beliefs about the nature of entrepreneurship and what it consists (Gartner, 1990). At first sight, this may appear a paradox: entrepreneurship research and teaching has been one of the fastest growing social sciences in recent years, not only in the United States (Katz, 2003) but also worldwide (Landström, 2005). In practice, as entrepreneurship scholars well know, there are many streams in entrepreneurship research and contributors originating from diverse disciplines, such that entrepreneurship research is often described as fragmented (e.g., Harrison & Leitch, 1996; Landström, 2001; Shane & Venkataraman, 2000; Wortman, 1987). Due to its eclectic nature, complications in contributing to the development of a purposeful research stream have arisen, and many researchers have lamented the lack of consensus in the domain. Indeed, Shane and Venkataraman (2000) suggest that entrepreneurship has become a "broad label under which a hodgepodge of research is housed." They argue that the field lacks a conceptual framework and, as a result, many people cannot identify the distinctive contribution of entrepreneurship to the broader domain of business management research. Aldrich and Baker (1997) note that there was limited progress toward coherence in the development of a paradigm, and indeed, Landström (2001) describes the domain as "pre-paradigmatic"[1] and "still in its adolescence." Moreover, Gartner (1990) warns that labeling a study as "entrepreneurship research" does not always identify what will be studied or why.

The present study is an attempt to identify some of these "fragments" of entrepreneurship research in a more formal manner, to examine their intellectual cohesion, and to assess whether linkages between intellectual contributions as evinced by literature analysis are associated with the more general academic and social networks in which these researchers are embedded.

Research Questions

Aldrich and Baker (1997, p. 398) argue that academic influence in entrepreneurship "comes from exemplary research . . . [that] the field will be shaped by those who produce research that interests and attracts others to build on their work"; a statement that should in essence apply to any empirically based scholarly activity.

In this article, our initial interest is to examine, using the formal quantitative technique of author co-citation analysis (ACA) and associated statistical analyses, the size, shape, and cohesion of some of the "fragments" which form the granular structure of the entrepreneurship field. Our first basic research question thus becomes:

1. Is there evidence—from the citers' perspective—of groups of authors developing themes of research that characterize and define the field of entrepreneurship?

1. From a Kuhnian perspective, the pre-paradigm period "is regularly marked by frequent and deep debates over legitimate methods, problems and standards of solutions" (Kuhn, 1970, p. 48)—a statement that would certainly ring true for any scholars attending conferences in the domain.

More specifically, we seek to:

1.1 Identify groups of entrepreneurship authors whose work falls into similar areas;

1.2 Explore the themes that characterize and define entrepreneurship in terms of the formal publication record.

The second research question relates to the social structure of the field.

2. Are authors who are highly co-cited merely part of a network of ideas constructed in the minds of the citers; or is there rather an underlying social and collaborative network of interactions between the highly co-cited authors which is not always immediately apparent from the published record?

Method (1)—ACA

The research methodology for the first part of our article draws on McCain's technical overview of mapping authors in intellectual space (McCain, 1990). ACA rather than document co-citation analysis was the technique of choice, since our focus was on social and intellectual structure *considered together* rather than identifying linkages between seminal contributions per se.

The methodology used to address the second question relied on standard social survey techniques, but is more conveniently described after the results of the ACA.

Selection of Authors

As is common with other ACA studies, a combination of subjective and objective measures was employed to identify the key authors. Authors were initially derived from a comprehensive database of research into entrepreneurship, small business, and innovation constructed within the Southampton Business School and which at the time contained more than 15,000 items. This includes full coverage of the major niche journals such as *Entrepreneurship Theory and Practice*, *Entrepreneurship and Regional Development* (ERD), *Journal of Business Venturing* (JBV), *International Small Business Journal* (ISBJ), and *Small Business Economics* (SBE), together with conference proceedings such as the Babson–Kauffman, Research in Entrepreneurship and Small Business (RENT), Entrepreneurship, Innovation and Small Business Network (ESBS/EISB), and Institute for Small Business Affairs/Institute for Small Business and Entrepreneurship (ISBA/ISBE) series, and more selective coverage of major (but nondomain-specific) journals such as those on the Social Science Citation Index (SSCI) list (cf. Watkins & Reader, 2004a, 2004b). An initial search generated a list of 4,405 works with the keyword "Entrepreneur$" cited within the document; there was no search on "small business."[2] This list was reduced to the main contributors to the field of entrepreneurship through a process of cross-referencing of authors with key edited books and published conference proceedings.[3] In a field dominated by U.S.-based authors, care was taken to include all

2. Although it is recognized that "entrepreneurship" and "small business" are terms that are sometimes used interchangeably, particularly outside the United States, the aim of this study is to describe aspects of the domain of entrepreneurship per se and, as such, it was deemed necessary to search only on entrepreneurship (cf. Torrès, 2004; Verstraete, 2003; Watkins, 1998).

3. The authors initially identified were cross-referenced with authors published in Birley (1998), a collection of landmark articles published as "Entrepreneurship"; this book was selected to represent a historical overview of the contribution of entrepreneurship researchers. In addition, the Babson–Kaufmann series was used to

European and other non-Americans of note at this first stage. Of course, logically, authors who are not highly cited could not be highly co-cited, so the majority of these initially included scholars would be dropped from the analysis at the next stage if they were not of equivalent significance to groups of citing authors.

Selecting the author set is probably the most contentious stage of the research; any finite set of authors is subject to some disagreement. Indeed, as White (1990, p. 99) states, "co-citation analyses are only as good as the analysts' choice of authors." However, in ACA, in contrast to other citation analyses, it is not so much the individual author who is of interest but more the co-citation of those authors with each other in an article produced by a *third* academic.

Retrieval of Co-citation Frequencies

In ACA, raw data are *sets* of documents associated with the names of the authors within the defined field. Data are obtained from counting the number of times any two selected authors are cited together in an article. The entire SSCI database was utilized for the co-citation analysis. Consequently, the data were not limited to the entrepreneurship literature as embodied only by specialist literature. This is particularly important when studying entrepreneurship; emergent fields may not develop specialist journals in their early stages, or, where these exist, they may not be indexed by the SSCI.[4] Thus, all the publications included in the SSCI were examined for the period 1972–July 2000. In this study, the total number of unique author pairs was 3,003.

In illustration, the number of works co-citing Colin Mason and David Storey were obtained from the intersection of the individual author sets: MASON-C$.CR. and STOREY-D$.CR. This search generated a co-citation frequency of 82. In other words, Mason and Storey, as a pair of authors, have been cited together by subsequent authors in 82 different works indexed by the SSCI. It should be emphasized that it is only the combination "Mason–Storey" that has meaning within a co-citation analysis. Both authors are likely to have written on other topics; thus, citation of each of their names alone may mean something broader (White & Griffith, 1981).

A real and well-recognized limitation of using the SSCI database is that co-citation data can only be collated for first authors; researchers who collaborate with others but who do not obtain first authorship are not represented. However, the Academy of Management (1990) endorses sharing credit "in correct proportion to the various parties' contributions"; coauthor order usually reflects authors' contributions.[5] Homographs were largely eliminated through knowledge of the field using visual inspection, although this is of course less of a problem for ACA than for most citation-based procedures.

In any ACA, some authors searched will not generate substantial co-citation frequencies despite having made important contributions to scholarly work in the target field. It was therefore important to determine realistic and testing threshold criteria. In determining these, we followed the procedure adopted by Rowlands (1999), *viz*:

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guide the selection of a final list. Authors were cross-referenced with those authors published in the following edited books: Sexton and Smilor (1986), *The Art and Science of Entrepreneurship*; Sexton and Kasarda (1992), *The State of the Art of Entrepreneurship*; and Sexton and Smilor (1997), *Entrepreneurship* 2000.

4. Thus, JBV and SBE were included in the SSCI from early in their histories; ISBJ is in the process of being added some 23 years after first publication.

5. This is a well-rehearsed issue in bibliometric studies, almost all of which use the Science Citation Index or the SSCI of the Institute for Scientific Information as their basis.

- Each author must have a total of at least 100 co-citation counts.
- Each author must be co-cited with at least one-third of the other authors.
- The mean co-citation rate for the whole set must be >4.

Implementing this procedure meant that 11 authors were eliminated, leaving a matrix of 78 authors. It should be recognized that some significant authors may have entered the field relatively recently, and although they may be well known within the research community, they may not yet have had the opportunity to build up a substantial citation history. Moreover, some authors may choose not to publish in the formal journal-based research literature, preferring to communicate their findings via alternative channels such as refereed conferences, or through writing books or reports. The final list is biased toward established figures with significant contributions over the years. It does not include all entrepreneurship authors but does include most of the well-known names.[6]

As in previous ACAs (e.g., Culnan, O'Reilly, & Chatman, 1990; Kärki, 1996; Rowlands, 1999), the principal diagonals were determined by using White and Griffith's (1981)[7] formula. This adds together the three highest co-citation frequencies for each author and then divides by two.

Converting Raw Data Matrix to Correlation Matrix

Using Pearson *r* as a measure of similarity between author pairs "registers the likeness in shape of their co-citation count profiles over all other authors in the set" (White & McCain, 1998, p. 331), thus providing richer information than the raw co-citation frequencies. In this study, authors Mason and O'Farrell show a high positive correlation (r = 887) as not only are they highly co-cited together but each is also additionally co-cited (frequently or infrequently) with the same authors. McCain (1990) suggests that this positive correlation "can be said to be perceived as related or 'similar' in some sense by the citing population" (p. 436). By the same measure, authors Mason and Sexton are negatively correlated (r = –.101). From an ACA perspective, this implies that Mason is much "closer" to O'Farrell in terms of an "intellectual relationship" than he is to Sexton.

Multivariate Analyses of Correlation Matrix

Three complementary multivariate analyses were conducted to display the inter-author relationships in our correlation matrix. This was undertaken using version 8.0 of SPSS.[8] These are cluster analysis, multidimensional scaling (MDS), and factor

6. For example, the winners in 8 of the 10 years in which the *FSF-NUTEK* Award has been given are included. (See http://www.fsf.se, and also Landström [2005] for an evaluation of the winners' contributions.)

7. The diagonal cells of the matrix caused some initial problems in calculating the correlations. These cells represent the intersection of a particular author with himself or herself (e.g., Mason–Mason), and it is a dilemma deciding what, if any, value should be placed here. An attempt was made to fill the empty spaces with the individual authors' overall counts (including self-citations and any homographs). However, the citation counts for prominent authors tended to be much larger than any co-citation count in the off diagonal cells and hence would have caused inaccuracies in the results. McCain (1990) suggests treating the diagonal cell values as missing data and calculating the co-cited author correlations accordingly. An alternate formula proposed by White and Griffith (1981) approximates for each author the value of the next highest score in the distribution. This indicates in a general way the relative importance of a particular author within the domain. The diagonal cells are determined by adding together the three highest co-citation counts for each author and dividing by two.

8. Previous ACA studies have tended to use one approach: Kärki (1996) and Paisley (1990) used factor analysis while the studies by Bayer and Smart (1990) and Zuccala (2001) used cluster analysis and MDS.

(principal components) analysis. Each of these approaches offers a different insight into the structure of the data. Authors are typically assigned to only one cluster (or appear as one point on the map), whereas they may load on more than one factor. Authors that load on only one factor may be said to have "crystallized identities in the eyes of the citers; authors that load on more than one factor have a more diffuse, pervasive impact" (White & McCain, 1989, p. 147).

Results (1)

The Intellectual Structure of Entrepreneurship: Clusters of Authors

To address the first concern of this study, which is the identification of groups of entrepreneurship authors whose work falls into similar areas, the correlation matrix was subjected to hierarchical cluster analysis using Ward's (1963) method. This study revealed nine clusters of authors whose work—from the citers' perspective—falls into similar areas (see Table 1).

A two-dimensional map of the correlation matrix, processed using the multidimensional scaling program ALSCAL, visually reflects the underlying structure of the data. The stress value and squared correlation are 0.14 and 0.92, respectively. McCain (1990) suggests that if the stress value is less than 0.2 and the R^2 is higher than 85%, a two-dimensional solution is a parsimonious one, which provides sufficient explanatory power. Figure 1 shows 51 of the 78 authors clustered on the two-dimensional map. Some authors are very close to one another because of their common research focus, while others are scattered.

Defining the Field of Entrepreneurship: Underlying Themes

To address the second objective of this study, which is to reveal the themes that characterize and define entrepreneurship, factor (principal components) analysis was used to identify those authors making significant contributions to a theme. As is commonly the case, the results were quite similar to the clustering and mapping analyses (McCain, 1990). Table 2 shows the eight factors[9] with author loadings of 0.50 and higher; 0.70 and above are shown in bold text.

Each factor is made up of a subset of authors who have made sizeable contributions to its composition. Some authors will not be evident in Table 2, as they did not make a

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Some studies (e.g., Culnan et al., 1990; Ding, Chowdhury, & Foo, 1999; White & McCain, 1998) have tended to use the three complimentary approaches to display the interauthor relationships in the correlation matrix. The difference between the approaches is that authors using cluster analysis (or MDS) are typically assigned to only one cluster (and appear as one point on the map), whereas using factor analysis, authors may load on more than one factor. It is felt that using just cluster analysis or MDS unnecessarily restricts the interpretation of the data. Factor analysis enriches the understanding of the data by showing the relationship among different factors as a result of the load values obtained. For example, a high-loading author will appear in only one factor; this aids interpretation, and themes become more obvious.

9. In this study, the correlation matrix was factor analyzed using a principal components analysis, with an orthogonal (varimax) rotation of the extracted factors available in SPSS version 8.0. This produces factors that are independent, with most authors having high loadings on only one. SPSS automatically generates a factor scree plot that helps determine the number of factors to be considered. In this study, the eight largest factors were extracted based on the scree plot. These eight factors account for 70.8% of the variance, with the first three factors accounting for 51.2%.

Table 1

Clusters of Entrepreneurship Authors

			Cluster A		
Aldrich, H.	Van de Ven, A.	Roberts, E.	Burgleman, R.	Kanter, R.	Jarillo, J.
McGrath, R.	Amit, R.	Block, Z.	Slevin, D.	Kuratko, D.	
			Cluster B		
Kilby, P.	Schumpeter, J.	Casson, M.	Kirzner, I.	Baumol, W.	Cochran, T.
Cole, A.					
			Cluster C		
Goffee, R.	Watkins, D.	Drucker, P.	Miner, J.	Miller, D.	Scott, M.
			Cluster D		
Chell, E.	Gibb, A.	Donckels, R.	Davidsson, P.	Reynolds, P.	Johannisson, B.
Kirchhoff, B.					
			Cluster E		
Brophy, D.	Tyebjee, T.	Bygrave, W.	Sapienza, H.	Wetzel, W.	
			Cluster F		
Busenitz, L.	Krueger, N.	Hansen, E.	Hoy, F.	Katz, J.	Gatewood, E.
Welsh, J.	Hills, G.				
			Cluster G		
Brush, C.	McDougall, P.	Chrisman, J.	Covin, J.	Sandberg, W.	MacMillan, I.
			Cluster H		
Birley, S.	Churchill, N.	Shapero, A.	Smilor, R.	Bruno, A.	Gasse, Y.
Hornaday, J.	Ronstadt, R.	Carsrud, A.	Gartner, W.	Vesper, K.	Cooper, A.
Low, M.	Wortman, M.	Bird, B.	Stevenson, H.	Hisrich, R.	Sexton, D.
Timmons, J.					
			Cluster I		
Acs, Z.	Audretsch, D.	Mason, C.	O'Farrell, P.	Storey, D.	Westhead, P.
Curran, J.	Stanworth, J.	Harrison, R.			

sizeable contribution to any specific factor. This is likely to indicate the breadth of their research or its importance to more than one specialized subdisciplinary area. The first eight factors account for 70.8% of the variance.

Interpretation of the ACA

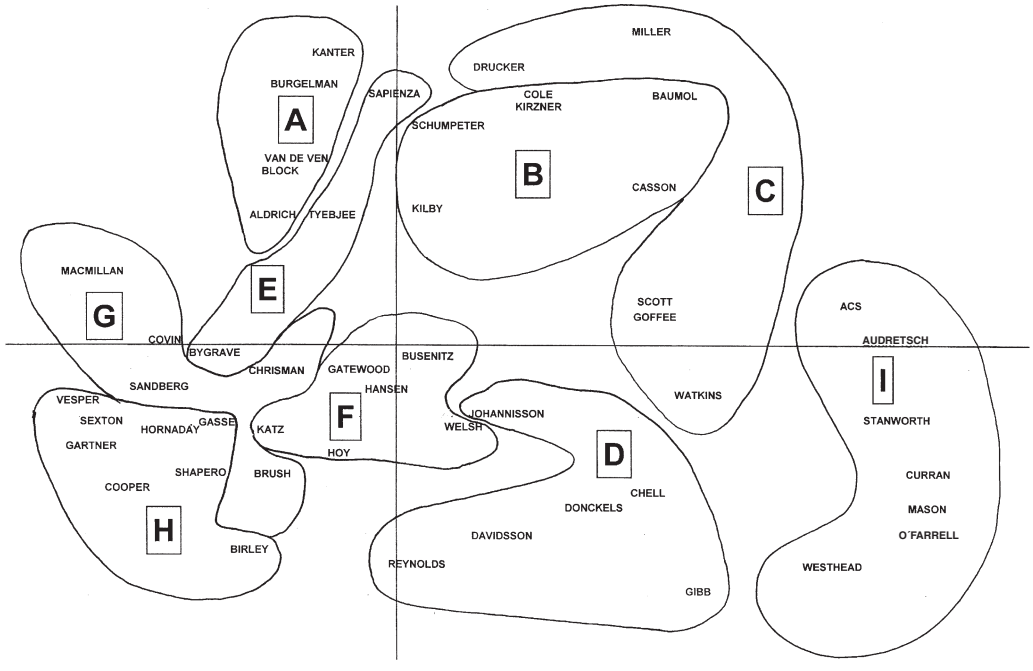
Interpretation relies on what the results of the multivariate analyses represent in terms of scholarly contributions and intellectual associations. It is the author-pair that has meaning rather than the research conducted by individual authors. In an ACA study, it is actually the citers that have built the basis of the structure that finally emerges.

Cluster analysis of the author co-citation data revealed nine author groups (A–I) in the field of entrepreneurship. This intellectual structure is mapped visually in Figure 1. Points are placed on the map according to their proximity in the author co-citation matrix. The more similar two authors are perceived to be, the closer they will be placed on the map. Authors with many links to others will be placed near the center of the map, whereas authors whose work is not seen as related are likely to be placed at some distance. Using as examples the same authors as above, we can see that Mason and O'Farrell were positively correlated and hence are placed closely on the map. On the other hand, Mason and Sexton were negatively correlated and are placed at either side of the map.

A prominent feature of this study is that British and American authors are in general placed far apart on the map. Üskiden and Pasadeos (1995) argued that in organization studies generally, North American co-citation networks are denser than European ones,

Figure 1

Two-Dimensional Map of the Correlation Matrix for Entrepreneurship Authors. Note: Simplified plot showing ~60% of data points for clarity in reproduction.



but that European ones are more branched. One explanation of this might be the natural tendency toward fragmentation that comes from researchers initially working in a variety of languages and cultures, whatever the eventual language of publication. Although true to some extent of any academic field, Hicks (1999) notes that social sciences research is oriented toward social context and, as such, tends to be inherently more "national." She notes that social scientists both write for, and read, fewer foreign language journals—or even foreign journals published in their native language. In the case of entrepreneurship research, such contextual issues as differences in legal frameworks and the relative availability of risk capital would seem to mitigate in favor of national fragmentation and enhance U.S. dominance of the field since American output would be intrinsically more coherent as well as numerically dominant. In addition, the major publication outlets are focused on work by American scholars to the extent that some have called for actions to be taken to redress the balance (Watkins, 2003), and certain journals—in a considered attempt to be more "international"—reserve part of each issue, or whole issues, for work originating outside North America. Interestingly, Aldrich (2000) suggests that research on entrepreneurship has developed in partial isolation between Europe and North America. Our results seem to confirm this; even between the United Kingdom and the United States, which share a virtually common language, there is little evidence of the international sharing of ideas and building on each other's work. More fundamentally, SSCI coverage is almost exclusively of English-language contributions. Very few of the authors listed regularly originate work in their native language where this is not English. Gasse and Johannisson are perhaps the most prominent current examples of those included in the

Table 2

Factor Analysis: Author Loadings at 0.50 or Higher

Factor 1		Factor 2		Factor 3		Factor 4		Factor 5		Factor 6		Factor 7		Factor 8	
Author	Loadings	Author	Loadings	Author	Loadings	Author	Loadings	Author	Loadings	Author	Loadings	Author	Loadings	Author	Loadings
Sexton, D.	**0.884**	Mason, C.	**0.929**	Burgelman, R.	**0.858**	Baumol, W.	**0.894**	Wetzel, W.	**0.871**	McDougall, P.	**0.783**	Miller, D.	**0.807**	Johannisson, B.	**0.749**
Gartner, W.	**0.844**	O'Farrell, P.	**0.882**	Block, Z.	**0.770**	Kirzner, I.	**0.880**	Tyebjee, T.	**0.868**	Brush, C.	**0.732**	Miner, J.	**0.776**	Jarillo, J.	**0.746**
Gasse, Y.	**0.838**	Storey, D.	**0.861**	Roberts, E.	**0.727**	Cole, A.	**0.848**	Bygrave, W.	**0.825**	Sandberg, W.	0.606	Drucker, P.	0.665		
Hornaday, J.	**0.838**	Curran, J.	**0.858**	Kanter, R.	0.696	Casson, M.	**0.804**	Brophy, D.	**0.761**	Chrisman, J.	0.580	Kanter, R.	0.608		
Carsrud, A.	**0.831**	Westhead, P.	**0.789**	McGrath, R.	0.684	Schumpeter, J.	**0.794**	Sapienza, H.	0.694			Scott, M.	0.591		
Low, M.	**0.786**	Gibb, A.	**0.764**	Slevin, D.	0.673	Cochran, T.	**0.790**	Bruno, A.	0.692						
Wortman, M.	**0.777**	Stanworth, J.	**0.720**	Van de Ven, A.	0.629	Kilby, P.	**0.783**	Timmons, J.	0.625						
Vesper, K.	**0.757**	Harrison, R.	**0.711**	Amit, R.	0.620			MacMillan, I.	0.526						
Ronstadt, R.	**0.753**	Chell, E.	0.672	MacMillan, I.	0.590										
Bird, B.	**0.729**			Covin, J.	0.548										
Shapero, A.	**0.726**			Aldrich, H.	0.530										
Hisrich, R.	**0.721**														
Churchill, N.	0.684														
Stevenson, H.	0.657														
Timmons, J.	0.651														
Hills, G.	0.647														
Cooper, A.	0.640														
Katz, J.	0.612														
Hoy, F.	0.590														
Smilor, R.	0.582														
Birley, S.	0.575														
Gatewood, E.	0.548														
Welsh, J.	0.536														

analysis; the late J.A. Schumpeter is still cited and co-cited regularly, but mainly in translation from the original German-language works.

Underlying Themes in Entrepreneurship

The factor analysis was undertaken to reveal the "hidden" subject matter. A factor is interpreted by the subset of authors loading on it, that is, making substantial contributions to its construction. Those authors loading highly on only one factor indicate a specialized interest—as perceived by the community of citing authors. Only three authors in this study—Kanter, MacMillan, and Timmons—were found to load above 0.50 on two factors, indicating a strong interest in their work by authors working in two otherwise distinct specialized areas of entrepreneurship research. All the other authors were regarded by the citing authors as having a unique specialist field—or at least were cited overwhelmingly in similar contexts, although this does not mean that the originating authors would necessarily share that view.

As with other research specialties that have been subjected to ACA, such as information policy (Rowlands, 1999), nationality was a key determinant of group membership in entrepreneurship. Factor 1, accounting for 31.7% of variance, comprises North American authors except one, Birley, who is British but worked in America for many years. Certainly, it is well known that North Americans tend to dominate the business management literature. In an examination of the "classics" in management literature, Thomas (1999) found that, despite including other countries' articles, American authors were overwhelmingly the most influential both in terms of total citations offered and the length of time over which this influence persisted. It is difficult to interpret Factor 1 as a theme because the research areas are varied. However, the general trend is toward specializing in the characteristics of the entrepreneur. Factor 1 is therefore categorized as consisting of those American authors who address such questions as: Who is the entrepreneur? What makes an entrepreneur? How can one behave entrepreneurially?

In contrast, Factor 2 comprises authors working in the United Kingdom. It should be noted that a concentration on essentially national issues such as the effects of government policy and funding initiatives are highly likely to have influenced the creation of this factor. This adds empirical support to Aldrich's (2000) suggestion that North American scholars tend to assume that their findings are universal, whereas European researchers appear to have made national differences a more important part of their argument. Thus theme 2, characterized as co-citations to the work of authors based in the United Kingdom, tends to focus on issues specific to the United Kingdom. From a methodological perspective, there is an emphasis on applied research rather than theory development in the work comprising this factor.

Initially, Factors 3 and 5 showed similarities. However, after careful examination of the evidence, theme 3 identifies authors with a common interest in corporate entrepreneurship as well as some interest in venture capital. Authors loading on Factor 5 identify with the theme of formal venture capital. There has been long-standing interest in the possibility that entrepreneurs are limited by lack of access to equity. Hence, this area has been heavily researched in the field. It is interesting to note that British authors Mason and Harrison, considered key researchers in the study of informal venture capital in the United Kingdom and founding co-editors of a specialist journal on venture capital research which accepts articles on a broad international basis, did not load on Factor 5. However, their own research concentrates on venture capital issues mainly in the U.K. context; hence, they load heavily on Factor 2, along with other work which the ACA record suggests is mainly of interest to U.K. researchers.

Economists and economic historians form Factor 4. Many of the cited articles in this factor are published in what most of those currently working in the field would regard as essentially nonentrepreneurship journals, for example, *Journal of Economic History* and *Business History*. The main concern of this work is the economic role of entrepreneurs. Contributions from Schumpeter, although particularly well-aged, are considered seminal in the entrepreneurship field and continue to attract large numbers of citations.

Factor 6 is associated with articles that are related to the study of female and ethnic minorities in entrepreneurship. Again, this factor tends to be biased toward America; indeed, a similar grouping with its focus specifically on female entrepreneurship in the United Kingdom is generated quite independently. Interestingly, MacMillan, who loads on both Factors 3 and 5, joins these scholars in Cluster G. In addition, Covin, who loads on Factor 3, is also present within this structure. This implies that scholars are specifically studying venture capital issues from the perspective of minority groups and co-citing these authors accordingly. Déry and Toulouse (1996) analyzed coauthor relations and found MacMillan's work, although broad, emblematic of the analysis of problems in evaluating investment projects. Authors loading heavily on Factor 7 seem to have common interests in organizational development and intrapreneurship. Factor 8 relates to only two authors, Johannisson and Jarillo, who have a keen interest in the effect of networking of entrepreneurs.

Limitations of the Current ACA

The subjective nature of the interpretation of the multivariate analyses is always of some concern. The co-citation analyst requires considerable knowledge of the specialty being examined; but even then, interpretation can be difficult for a number of reasons. Interpretation is based on those articles published and cited in the SSCI database. It is well known that the characteristics of the social sciences literature mean that the SSCI's coverage is less comprehensive than that of its natural science partner, the Science Citation Index (SCI). Hicks (1999) found that books comprise at least 40% and possibly as much as 60% of the social sciences literature. Moreover, Watkins (1995) found that the most highly cited U.K. entrepreneurship articles up to that time were not in the normal journal literature but were books—in particular, nonjournal, edited collections in book form. The SSCI indexes only journals (not books) and all references from those journals (whether to journal articles or books). This raises questions as to whether this study covers a sufficiently representative sample of entrepreneurship research, specifically nonjournal literature. Nonetheless, the publication of an author's work in an academic journal and its subsequent citation by others in the field is as important to an entrepreneurship scholar as it is to any other researcher. The emphasis on publication for professional recognition remains the same; as fields of study mature, this tends increasingly to mean publication in the specialist journal literature of that field (Watkins & Reader, 2003).

Our ACA shows a static snapshot of entrepreneurship. An examination of the temporal development of the field would have been insightful; rather than examine 28 years of literature, the data could have been split into several time periods. It would have been interesting to trace the progress of the field over the past few decades. This may be a more realistic endeavor in the future; however, until recently the volume of data per year would not permit a robust analysis using the techniques discussed.

However, whatever the limitations of the data and the technique, the results discussed in the article so far gave us sufficient confidence for use as a platform enabling us to proceed to our second of research question: Are authors who are highly co-cited merely

part of a network of ideas constructed in the minds of the citers; or is there rather an underlying social network of interactions between the highly co-cited authors which is not always immediately apparent from the published record?

Direct Assessment of the Social and Collaborative Nature of Entrepreneurship Research

White and McCain (1989, p. 148) point out that authors are likely to ". . . have not only subject matter and method in common but also collaborative ties." Melin and Persson (1996, p. 375) further argue that "it is reasonable to assume that scientific networks are based on several forms of interaction that reinforce each other—scientists that read and cite the same literature tend to meet, which may lead to collaboration and coauthored articles and/or citations to each others documents." However, this view is rarely tested since not only are the techniques required very different from those of bibliometric research, but also, historically, many ACAs have, for technical reasons, been quite small. The next section of the article investigates the existence or otherwise of social and collaborative ties between those leading entrepreneurship authors previously identified. In doing this, we follow and develop the approach of Rowlands (1999).

Method (2)—Questionnaire Follow-up

Exploring the Social and Collaborative Structure of Entrepreneurship Research

To explore the social and collaborative nature of entrepreneurship research directly, we sent each of the individuals identified previously an e-mailed (or—rarely and *in extremis*—a postal) questionnaire. However, the questionnaires, although of the same format and asking equivalent questions, were not identical. Each questionnaire was individually tailored to the particular recipient author. The initial stage of this tailoring process involved identifying the three most "similar" authors and the three most "dissimilar" authors from the Pearson correlation matrix. The most similar authors were identified as those who were positively correlated (and preferably within the same cluster), thus exhibiting a close intellectual relationship. The most dissimilar authors were classified as those who were either negatively correlated or had a low correlation, thus implying a distant intellectual relationship. As an example, consider the case of Mason. The three most similar authors to Colin Mason were Harrison ($r = 0.8$), Storey ($r = 0.8$), and O'Farrell ($r = 0.9$). The three most dissimilar authors were Brush ($r = -0.1$), Gatewood ($r = -0.1$), and Kuratko ($r = -0.1$). These were therefore the six authors included in the questionnaire sent to and returned by Mason.

This process of most similar/most dissimilar author selection was conducted independently for each of the 78 separate authors in the sample, thus giving 78 equivalent but distinct questionnaires. These were then dispatched to each author with a covering letter explaining explicitly that the aim of the research was to try to understand the intellectual and social structure of entrepreneurship as a domain of academic study.[10]

10. More precisely, after piloting, a preliminary e-mail was sent to arouse interest, followed by the research instrument and covering documentation a week later, and then finally by a reminder to nonrespondents after a further week.

In the first question, each author was asked whether they recognized the six named entrepreneurship scholars individualized to them as above. Respondents were asked the following questions: (1) Is the name familiar? (2) Can you put a face to the name? (3) Are you reasonably familiar with their written work?

The second question attempted to capture some of the social and collaborative ties between the authors. Respondents were asked the following questions:

- Have you ever collaborated on a research project?
- Have you ever coauthored a paper?
- Do you remember having cited any of these authors?
- Did you ever work for the same employer at the same time?
- Have you ever exchanged drafts or working papers?
- Have you ever maintained regular correspondence (post or e-mail)?
- Have you ever sought their advice (or vice versa)?
- Have you ever shared a platform or a speaking engagement?
- Have you ever sat together on the same committee?
- Have you ever jointly developed a course or a research program?
- Do you regard these authors as real or potential allies?

In the third question, respondents were informed that the six authors had been selected for a reason: three of the authors were regarded as "close" intellectual relations of theirs and three were regarded as "distant" intellectual relations. Respondents were asked to identify with which authors they considered they had a "close" or "distant" intellectual relationship. This question also provided a "don't know" category so respondents were not forced to make an inappropriate choice.

The fourth question, tentatively, examined the interpretation of the themes of research as discussed earlier in the context of the ACA outcomes. Specifically, each respondent was asked to select the "theme of research" with which they thought they would be most closely associated by others. Note that this question is explicitly perceptual, as the themes of research had been derived from the factor analysis based on the citers' perspective. Nonetheless, it was felt it would be useful to have the respondents' opinion on the theme of research they thought they would most likely be associated with.

The questionnaires were well received by the respondents, and 54 usable questionnaires were received; the active response rate was 76%.[11] Most completed questionnaires were returned within one week and many respondents provided additional qualitative information. After a general analysis, responses were split into the nine clusters identified in the cluster analysis and examined to explore the social and collaborative associations within each cluster of authors.

Results (2)

Mutual Recognition of Other Leading Authors

The results show that of the authors who were deemed close intellectual relations, respondents recognized 92.6% of the names and were able to put a face to the name in 82.7% of cases. It is clear that respondents were very familiar with the names of their close intellectual relations and were able to recognize them. In contrast, although respondents

11. This already high response rate understates the cooperation given. Several authors on the original list are deceased, known to have retired, or were otherwise untraceable.

recognized 45.1% of the names of their distant intellectual relations, they were only able to put a face to the name of 24.1% of these authors. Respondents were familiar with the work of 86.4% of their assumed close intellectual relations. On the other hand, they were only familiar with the work of these scholars in 29.0% of cases. Thus, respondents are far more familiar with the names, the faces, and the work of their close intellectual relations than those of authors considered distant. These results were much in line with expectations. The extent of this familiarity—in the form of social and collaborative ties—is developed in analyzing the detailed responses to question 2.

Social and Collaborative Ties

As discussed earlier, question 2 attempted to elucidate the social and collaborative relationships that authors may or may not have with each other. The questions focused on routine aspects of academic life: what one might describe as normal collegiality. As White and McCain (1998) point out, one of the limitations of ACA is that the method "leaves out almost all the good parts" (p. 327). Here, we were trying to identify and reclaim some of those "good parts."

Research Collaboration, Coauthorship, and So on

Figure 2 displays the results from the social and collaborative questions. The light bars indicate the social and collaborative ties shared with a "close" intellectual relation; the dark bars show those ties shared with a "distant" intellectual relation.

Collaboration can bring complementary backgrounds to a research project. The respondents were asked whether they had ever collaborated with any of the listed authors on a research project. As with question 1, the respondents did not know which authors were considered "close" intellectual relations or which were "distant." Of the authors deemed close intellectual relations, respondents said they had collaborated with 24.7% on a research project; they had collaborated with only 1.9% of the authors who were deemed distant intellectual relations.

Respondents had coauthored an article with 14.8% of their close intellectual relations; they had coauthored an article with a negligible 0.6% of their distant intellectual relations.

Respondents were next asked whether they remembered citing any of the authors identified in their questionnaire: 79.0% reported that they had cited the work of their close intellectual relations, whereas they had cited only 23.5% of the work of their distant intellectual relations.

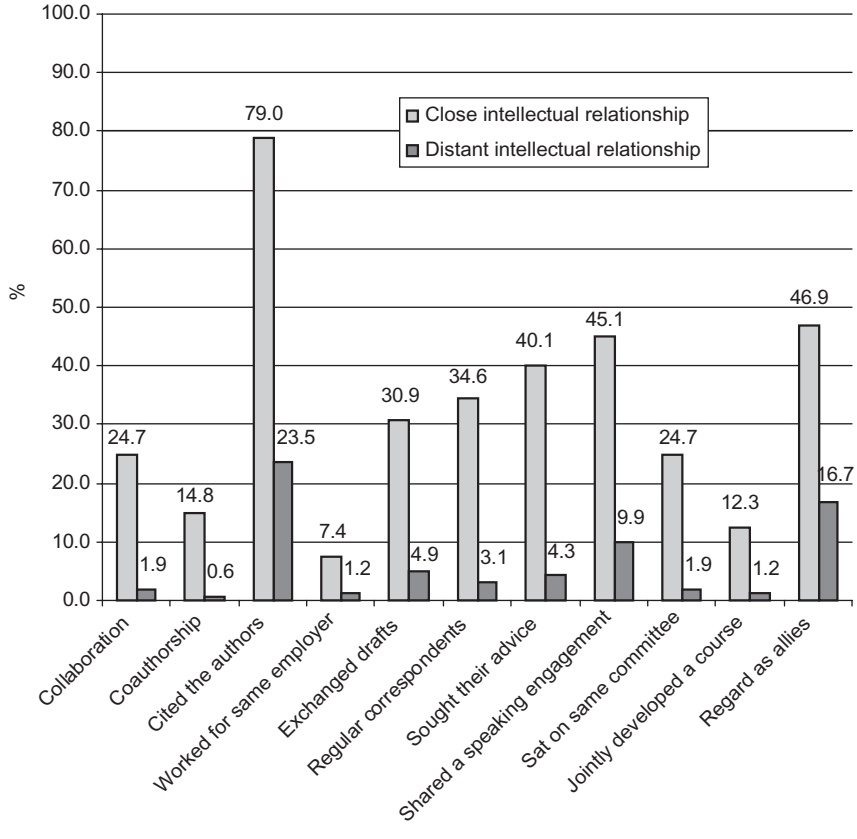
When asked whether they regarded any of the authors identified in their questionnaire as real or potential allies, respondents thought of almost half (46.9%) of their close intellectual relations in this way, but only 16.7% of their distant intellectual relations were thus regarded.

The same employer had employed respondents, at the same time, with 7.4% of their close intellectual relations. Respondents had worked with only 1.2% of those sharing distant intellectual ties.

Three questions addressed the sharing of expertise. The first of these asked respondents whether they had ever exchanged drafts or working papers with any of the six authors identified. This had occurred with 30.9% of their close intellectual relations, but with only 4.9% of their distant intellectual relations. The second question asked whether they ever maintained regular correspondence with any of the six identified authors. It is important to recognize that this question did not involve a particular activity—for

Figure 2

Social and Collaborative Ties between Authors



example, exchanging drafts or seeking advice. It implies that authors maintain regular correspondence on a more social level, simply to "keep in touch" as well as on an academic level. Respondents reported that they had maintained regular correspondence with 34.6% of their close intellectual relations. By contrast, respondents maintained regular correspondence with only 3.1% of their distant intellectual relations. The third question in this group asked whether they had sought the advice of, or given advice to, any of the authors identified in their questionnaire. Respondents had sought advice—or vice versa—from 40.1% of their close intellectual relations, but from only 4.3% of their distant intellectual relations.

Respondents had shared a speaking engagement with 45.1% of their close intellectual relations, whereas this figure was only 9.9% with their distant intellectual relations among entrepreneurship scholars. Similarly, when asked whether they had ever sat on the same committee with their close intellectual relations, respondents reported that this was so in 24.7% of cases, while these activities had been shared with only 1.9% of their distant intellectual relations.

Respondents were asked whether they had ever jointly developed a course or a research program with the authors identified in their questionnaire. This was the case with

12.3% of their close intellectual relations; in comparison, respondents had developed a course or a research program with only 1.2% of their distant relations.

Intellectual Distance

The respondents were next informed that, according to the SSCI, the co-citation profiles of three of the authors correlated strongly with theirs, whereas the other three correlated only very weakly or negatively. The respondents were not told which authors were considered close intellectual relations or which were considered distant intellectual relations. Question 3 then asked the respondents whether they could identify which authors should be regarded as being "close" to them and which as being "distant" to them.

Respondents identified 69.8% of their close intellectual relations by allocating authors to the correct category. They could not identify 11.1% of their close intellectual relations. Moreover, they allocated 19.1% of authors to the incorrect category (i.e., distant). They were able to identify 44.4% of authors that were considered distant intellectual relations. Respondents misallocated only 9.3% of these authors to the incorrect category (thinking that their distant relations were actually their close intellectual relations). However, respondents did not know whether 46.3% of distant authors were regarded as close or distant intellectual relations. Marginalia suggests that this is likely to be because the respondent did not know the author, and so consequently could not comment on whether they were to be regarded as close or distant to themselves. Additionally, "close" was sometimes also interpreted as "in agreement with," rather than "actively pursuing similar interests." This may explain much of the apparent misallocation of "close" to "distant" as recorded above.

Self-Allocation to Clusters

Clustering based on the ACA reported above resulted in nine groups of authors that could be described as representing "themes" of research. Each of the authors was allocated to one of these themes based on their co-citation data. However, interpretation of what these themes represent can be difficult. Initially, the total corpus available of each of the authors' work was thoroughly reviewed through an online search of their publications and, if available, their personal profiles. These data were categorized into the nine clusters to help reveal the essential content. The preliminary themes were identified as:

- corporate entrepreneurship;
- the economic role of entrepreneurs;
- organization change and development;
- start up and growth of new ventures;
- formal venture capital;
- strategic management in entrepreneurship;
- female/ethnic minorities and family business;
- characteristics of entrepreneurship; and
- government policy and regional development.

Recognizing that their research interests were likely to be broad, respondents were asked to look back over their research careers and place themselves into one of the clusters. Respondents were asked to indicate a first choice, and a second if appropriate. Some 41.3% of the respondents who attempted to categorize themselves did so "correctly" as either their first or second choice, 30.5% as first choice, and 10.8% as second

Table 3

Self-Allocation to Theme

Theme	% of respondents who identified themselves with the "correct" cluster
1. Corporate entrepreneurship	42.8 (n = 3)
2. The economic role of entrepreneurs	100.0 (n = 3)
3. Organization change and development	25.0 (n = 1)
4. Start up and growth of new ventures	75.0 (n = 3)
5. Formal venture capital	100.0 (n = 2)
6. Strategic management in entrepreneurship	16.6 (n = 1)
7. Female/ethnic minorities and family business	0.0 (n = 0)
8. Characteristics of entrepreneurship	40.0 (n = 4)
9. Government policy and regional development/franchising	40.0 (n = 2)

choice. However, the number of respondents who felt able to answer this question was lower than anticipated. A breakdown is given in Table 3.

General Comments on the Results of Social and Collaborative Associations

At first sight it may appear unusual, given the relatively strong social and collaborative links demonstrated above, that only 14.8% of respondents had coauthored articles with their close intellectual relations. However, these results are not necessarily surprising. Floyd, Schroeder, and Finn (1994) found that research collaborations often involve unequal authors—for example, professors working with their Ph.D. candidates and other more junior colleagues. In addition, Becher (1989) suggests that "an individual academic's reputation is likely to be more decisively established if the person concerned takes full, unambiguous responsibility for his or her work" (p. 95). Therefore, our highly co-cited—and thus highly cited—group is more likely to have published with their juniors or on a sole authorship basis. In addition, some of the key publications go back to the earliest days of the entrepreneurship research field, when people later regarded as intellectual leaders found it harder to attract collaborators.

Certainly, this lack of coauthored publications has not inhibited the core author group themselves from citing their close intellectual relations. Some 79.0% had done so. This supports Merton's (1988) classic view that the most widespread and basic form of scholarly recognition is "that which comes with having one's own work used and explicitly acknowledged by one's peers" (p. 620). What is perhaps more surprising, given the clear fragmentation that this study suggests, has already occurred in entrepreneurship research; that is, although authors cite their close relations more often—due to their common research interests—the domain is not so fragmented that no citations are made to more distant intellectual relations (23.5%), albeit here the evidence applies specifically to the citation of the most highly cited/co-cited people in other clusters.

Attitudes toward sharing expertise are worthy of comment. Becher (1989) observed that, in virtually every domain of study, there was evidence of an inner and outer circle of professional acquaintance. He found that within the inner circle, bonds were tighter and more resilient; scholars within the inner circle shared a direct affinity with each other and

a closely shared interest. Our questions evaluated the social interaction of authors—issues of trust, respect, and friendship being integral to these questions. The level of interaction at the level of sharing general expertise implies that respondents respect their close colleagues' opinions on their own work—and trust them not to abuse trust by making improper demands or unscrupulous use of materials. It is hoped that entrepreneurship research can maintain this tradition as it grows.

Sharing a speaking platform is so common that it should come as no surprise. Eminent researchers are often requested to give introductory remarks, to deliver keynote speeches, to appear on discussion panels, and so on. Compared to the other questions, sharing a platform is a more indirect evaluation—rather akin in itself to the award of a published citation—since it is likely that respondents might have shared a speaking platform based on the actions of other actors. Closely related authors sharing a common theme of research are drawn into similar academic circles through the actions of their colleagues as well as by their own actions. Much the same considerations apply to joint membership of committees at all levels.

The issue of joint course development may indicate changes in the wider academic environment. Respondents stated that they had developed a course or a research program with 12.3% of their close intellectual relations. Developing a course would normally involve working together within the same institution. However, respondents reported that they had worked for the same employer with only 7.4% of their close intellectual relations. The demand as well as the scope for developing research—and teaching—programs collaboratively is increasing. Many funding organizations now insist on collaborative ties between institutions and even countries. These ties are likely to be more firmly grounded if based on strong intellectual and social interactions rather than on bureaucratic fiat.

Detailed Analysis of the Clusters

Some clusters are more socially cohesive than others. Given that it is so difficult to define "entrepreneurship research" as a domain or metafield, it is hardly surprising that some clusters are themselves not specifically characterizable as such and intellectually coherent to their "members" as determined by the ACA. However, it should be reiterated that these interpretations are from the authors' perspectives as the producers rather than the third-party users of that literature, which is what the ACA indicates. Certainly, there exists a wealth of evidence above those strong social and collaborative ties. Given this platform, it is possible also to comment at the level of the individual cluster, although the small numbers involved in some cases make conclusions somewhat tentative.

Cluster A. Eight out of the eleven entrepreneurship authors in Cluster A returned usable questionnaires. Authors were familiar with 83.3% of the written work of their "close" intellectual relations. By contrast, they were familiar with only 12.5% of the written work of their distant intellectual relations. Authors had regular correspondence with 20.8% of their close relations while no one in this cluster had regular correspondence with their distant relations. Authors sought the advice of 16.7% of their close relations and had shared a speaking platform with 37.5% of them; again, not one author had engaged in these activities with their distant relations. The results demonstrate that authors in Cluster A are more than just a constellation; they do have social and collaborative ties, which indicate an informal community. The description given to this cluster was "corporate entrepreneurship"; three authors agreed with this allocation. Four authors suggested "start up and growth of new ventures." However, this may have been understood as including

new corporate ventures—often also called internal new ventures—by authors interested in that topic.

Cluster B. Three authors responded to the questionnaire. Authors were familiar with 77.8% of the work of their close intellectual relations. By contrast, none of the authors recognized the name, could put a face to the name, or were familiar with the work of their distant intellectual relations. Although this cluster does not share many social and collaborative ties, the authors agreed unanimously with the allocation of their research interest—the economic role of entrepreneurs. In general, the economists seemed to have a coherent view of their own and others contributions, perhaps because of their embedment within a well-established discipline, but little knowledge of, or interest in, work on entrepreneurship outside their own discipline.

Cluster C. The four authors who provided data were familiar with 83.3% of the written work of those deemed close intellectual relations. Although authors recognized the name of 41.7% of their distant intellectual relations, none of the authors was familiar with their work. This group exhibits social and collaborative ties in that authors were corresponding regularly, seeking advice, and sharing speaking platforms with a third of their close relations. The authors had also collaborated and coauthored articles with 16.7% of their close relations. They regarded 50% of their close intellectual relations as allies. However, it was difficult to assign an appropriate research interest for this cluster. Only one author agreed (as second choice) that the research interest labeled "organization change and development" was an accurate description. The other authors categorized themselves into a range of research interests.

Cluster D. All the authors responded to the questionnaire. They knew the name of 95.2% of their close intellectual relations and were familiar with 85.7% of their written work. They also knew the name of 61.9% of their distant relations and were familiar with 52.4% of the work of their distant relations. This is not surprising. The authors in cluster appear in the middle of the map in Figure 1, and it is therefore likely that they will be more familiar with a greater number of the other authors. Three of the authors agreed that "start up and growth of new ventures" was their main research interest. However, three authors were unable to answer this question.

Cluster E. All the authors who responded were familiar with the name and were able to recognize all their close intellectual relations. These authors were familiar with 88.9% of the relevant work. In contrast, they were only familiar with 33.3% of their distant relations' written work. Although no one had collaborated or coauthored work with their close relations, authors in this cluster had cited the work of all their close relations. This cluster was described as "formal venture capital"; both authors who responded to this question agreed this described their research interest.

Cluster F. All the respondents were familiar with the name of their close intellectual relations. They were able to put a face to the name and were familiar with the work in 94.4% of cases. They exchanged working drafts and had regular correspondence with 44.4% of their close relations, whereas these activities were carried out with only 5.6% of their distant relations. Although sharing particularly strong collaborative and cooperative ties with their close relations, this group could not agree that they shared a distinct and common research interest. Only one author agreed with the allocated label of "strategic

management in entrepreneurship." Three of the six authors felt "start up and growth of new ventures" was a more appropriate description of their research.

Cluster G. All the respondents in this cluster knew the name, could put a face to the name, and were familiar with their written work of their close intellectual relations. In contrast to the other clusters, this group also knew the name of 73.3% of their distant relations and was able to identify 46.7% of their written work. All the respondents were able to identify those authors who had been characterized as their close intellectual relations. None of the respondents agreed with the label of "female/ethnic minorities and family business." All respondents cited either "start up and growth of new ventures" or "strategic management in entrepreneurship" as an appropriate description of their research interest (either first or second choice). They appeared to have a view of their work as having greater interest and applicability than did the users of their output as evinced by the citation record.

Cluster H. This is a large group of authors who are mainly North Americans. Eleven responded to the questionnaire, and as with the other clusters, authors were quite familiar with the name of their close intellectual relations (81.8%). Respondents could put a face to the name of 78.8% of their close relations, whereas they could only put a face to the name of 27.3% of their distant relations. Where written work was concerned, respondents were able to identify 81.8% of the work of their close relations but only 24.2% of their distant relations. The respondents considered 63.6% of their close relations as real or potential allies, whereas they only regarded 24.2% of their distant relations in this way. The current authors had labeled these authors as those with a particular interest in the "characteristics of entrepreneurship." Of those respondents able to answer this question, only three agreed with this as a first choice, with one respondent agreeing as second choice. The others again felt that "start up and new venture creation" was a more appropriate descriptor for their research.

Cluster I. This final cluster identified mainly U.K. authors, Acs and Audretsch being the exceptions. The group demonstrated particularly effective collaborative and cooperative ties with their close intellectual relations. Respondents had collaborated on a research project with 52.4% of their close relations; by contrast, there were no collaborations with distant relations. Respondents exchanged working drafts with 61.9% of their close relations; again, none had been exchanged with distant relations. Respondents regarded 66.7% of their close relations as real or potential allies, whereas only 14.3% of distant relations were regarded as allies. This group tended to have a national perspective on research and accordingly the research interest was initially labeled as "government policy and regional development." Five respondents felt able to address this question, but only two felt this was an appropriate descriptor for their research interests. It seems that citers relate to these authors from a national perspective rather than a research focus perspective.

The analysis by cluster clearly demonstrates that within each of the nine constellations there also exist social and collaborative ties between those considered close intellectual relations. By contrast, although many of the respondents were familiar with the name—and sometimes the work—of their distant relations, here there are much more limited or entirely absent social and collaborative ties. The data from the follow-up questionnaire clearly provides evidence for Gartner's (2001) suggestion that informal communities of entrepreneurship scholars already exist. However, these vary in cohesiveness and also—perhaps more surprisingly—in their ability to identify exactly what it is they share in common at an intellectual level.

Discussion

The norms and values of a domain and the scholar's acceptance within that domain are affirmed by interaction with like-minded colleagues in the form of what Crane (1972) calls "invisible colleges." Lievrouw (1990, p. 62) suggests that the "invisible college" is an informal communication process and she cites Price's definition of "an informal affiliation of scientists with common interests who were already strongly embedded in other institutions—indeed had risen to the upper ranks of those institutions—and who might live some distance from one another."

The author co-citation analyses can be interpreted to infer the presence of invisible colleges in the shape of informal communication links between closely related authors. However, Lievrouw (1990) warns that the structural data do not—in themselves—reveal the nature of these relationships. The specific objectives of the follow-up questionnaire were to establish whether these inferred links do in fact exist and, if so, to probe their nature. The results seem to indicate not only that within entrepreneurship research strong social and collaborative ties are associated with the intellectual ties established by the ACA, but also that ACA itself is a robust technique—something often taken on trust by the bibliometric research community. The questionnaire used in this study has directly evaluated the nature of these relationships, and it is clear from the results that there is strong evidence that closely related authors share both formal and informal communication links. Respondents were very familiar with the names, faces and work of their close intellectual relations. When asked about their social and collaborative ties with the authors identified in their questionnaire, the respondents had collaborated on projects, coauthored articles, shared working drafts, and cited the work of their close intellectual relations; in comparison, very few respondents shared social and collaborative relationships with their distant intellectual relations.

An important point to note is that where here we talk of "invisible colleges" it is not entrepreneurship research per se that is the college (as may have been the case in the 1960s or 1970s)—it is now anything but invisible. The "invisible colleges" are the "fragments" or subfields identified in the ACA and broadly validated by the questionnaire survey. In general, these are "invisible" not only to scholars outside the entrepreneurship research metafield, but to most of those within it. Very few people here—we identified only three, Kanter, MacMillan, and Timmons—seem likely to be able to claim membership of more than one such college on the basis of their published output and the uses to which it is subsequently put. Most "entrepreneurship researchers" are very narrowly focused and most colleges are likely to be not only invisible but also small, particularly since so many researchers are transients (Cornelius, 2006).[12] This focus is likely to be increasing over time as scholarship related to entrepreneurship becomes increasingly institutionalized, since a reputation as "the" expert on a particular issue, topic, or technique is the way to build a successful academic career.

Although the numbers in each cluster are relatively low, and—despite the high response rate—are even lower in the follow-up study, it is still possible to make a few general comments on the nature of the "fragments" of entrepreneurship research, which have been identified.

The first point of note is the desire of people from so many groups to lay claim to the theme "start up and growth of new ventures." This went across the metafield of entrepreneurship—from the corporate venturing specialists through to the gender/

12. In this current *Entrepreneurship Theory and Practice* issue.

ethnicity writers. Given that there have been concerted attempts in recent years to move the field away from this characterization—toward opportunity recognition, innovation, and organization building in particular—this was somewhat unexpected. It is even more surprising given that the people whom the ACA had clustered under this theme were themselves ambivalent about accepting the label. There are two possible reasons for this paradox. First, this theme appears in a cluster in the center of the ACA map, which indicates relations to a range of people/themes. Second, the data used cover the period 1978–2000 and are not split into time periods. The analysis may in part be capturing a position from which the metafield has now moved. Follow-up ACAs and similar studies are certainly required using more recent data as this becomes robustly available.

The cluster labeled "strategic management in entrepreneurship" was among those claiming the "start up and growth of new ventures" label most aggressively. The borderlands between "strategic management" and "entrepreneurship" are an area where more research needs to be carried out—or perhaps where existing research should be shared more proactively. Verstraete (2003) has drawn attention to the lack of citations given within the strategic management literature to work which would normally be recognized by readers of this journal as part of the core entrepreneurship literature, even when the nominal theme is "strategic entrepreneurship." Perhaps, as in the case of the "overlap" with the "small business management" literature one can understand soi-disant entrepreneurship researchers seeking to distance themselves from strategic management to assert their own individuality and academic virility. However, it is less clear why mainstream strategic management authors should pay so little attention to entrepreneurship scholarship rather than seek to subsume it.

Similarly, the cluster identified within the ACA and labeled "organization change and development" seemed robust in terms of the social and collaborative interactions, but the label was largely rejected by the members of the cluster. Given the apparent desire of some U.S. academics (e.g., Busenitz et al., 2003) to embed entrepreneurship in a wider organizational studies context, this is again unexpected. Of course, it may just be that the current authors did not articulate a suitably appropriate and compelling label.

On the other hand, perhaps there may be deeper forces at work. First, entrepreneurship is a fast moving field and, like management studies generally (Thomas, 1999), is subject to fads and fashions as much as to "progress." For example, the once-prolific stream of work on "entrepreneurial characteristics" has slowed to a trickle; the cluster that the ACA identified (and which the authors labeled as such) was accepted as a cluster by those in it, whereas the label was rejected in favor of the ubiquitous "start up and growth of new ventures."

Second, it was something of a surprise that even the elite group of respondents participating in the study—although recognizing that there was a close relationship in their work with certain other key researchers—generally had so much difficulty identifying the essence of that similarity. ACA identifies bodies of work by authors that have some intellectual similarity in the eyes of the citer. It is chastening for us all to recognize that—as with any other goods placed onto the market—we have no lasting control over the uses to which our ideas are put when placed in the marketplace for ideas. However, if entrepreneurship scholars do not trust the market, who will?

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