

Mapping the (in)visible college(s) in the field of entrepreneurship

Aurora A. C. Teixeira

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Abstract Despite the vitality and dynamism that the field of entrepreneurship has experienced in the last decade, the issue of whether it comprises an effective network of (in)formal communication linkages among the most influential scholars within the area has yet to be examined in depth. This study follows a formal selection procedure to delimit the ‘relational environment’ of the field of entrepreneurship and to analyze the existence and characterization of (in)visible college(s) based on a theoretically well-grounded framework, thus offering a comprehensive and up-to-date empirical analysis of entrepreneurship research. Based on more than a 1,000 papers published between 2005 and 2010 in seven core entrepreneurship journals and the corresponding (85,000) citations, we found that entrepreneurship is an (increasingly) autonomous, legitimate and cohesive (in)visible college, fine tuned through the increasing visibility of certain subject specialties (e.g., family business, innovation, technology and policy). Moreover, the rather dense formal links that characterize the entrepreneurship (in)visible college are accompanied by a reasonably solid network of informal relations maintained and sustained by the mobility of ‘stars’ and highly influential scholars. The limited internationalization of the entrepreneurship community, reflected in the almost total absence of non-English-speaking authors/studies/outlets, stands as a major quest for the field.

Keywords Bibliometrics · Entrepreneurship · Invisible college

JEL Classification Z10 · L26 · C89

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A. A. C. Teixeira (✉)
CEF.UP, Faculdade de Economia, Universidade do Porto,
Rua Dr Roberto Frias, 4200-464 Porto, Portugal
e-mail: ateixeira@fep.up.pt

A. A. C. Teixeira
INESC Porto, Universidade do Porto, Porto, Portugal

A. A. C. Teixeira
OBEGEF, Universidade do Porto, Porto, Portugal

If we are interested in explaining what Haavelmo has described as the “really big dissimilarities in economic life”, we must be prepared to concern ourselves with entrepreneurship. (Baumol 1968, p. 65)

Introduction

Entrepreneurship is “an important and relevant field of study” (Shane and Venkataraman 2000, p. 224) and has emerged as one of the most vital, dynamic, and relevant fields in management, economics, regional science, and other social sciences.¹ Although it has struggled since the 1970s to be defined as a field and gain legitimacy as a valid academic area of research (Cooper 2003), in the 2000s, a number of scholars devoted their attention to entrepreneurship as a core research field (Alvarez et al. 2010), and it has become increasingly more theory-driven and coalesced around a central core of themes, issues, methodologies, and debates (Wiklund et al. 2011).

The boom in entrepreneurship scholarship led to the need to measure scientific production in entrepreneurship and to understand the scientific structure of the field, such that several studies have dedicated significant attention to the matter (Cornelius et al. 2006; Grégoire et al. 2006; Schildt et al. 2006). Underlying the scientific structure of a field is a network of informal communication linkages among the most influential scholars within that area. These groups of mutually interacting and prolific scientists, who exchange knowledge through communication channels, were named “invisible colleges” (Crane 1972). In spite of the academic interest in entrepreneurship, invisible colleges, per se, have yet to be examined in depth based on a theoretically well-grounded framework.

Many studies have reviewed, analyzed, and summarized the literature on entrepreneurship over the last few decades from a subjective perspective (Low and MacMillan 1988; Davidsson et al. 2001; Hoang and Antoncic 2003; Zahra 2007; Davidsson 2008; Steyaert et al. 2011). As a complement to this approach, the present study follows an objective procedure to identify the structure of the field of entrepreneurship based on bibliometric techniques. As Watkins and Reader (2004) put it, the usual way to identify the ‘leading edge’ or ‘research front’ of a research field, other than by immersion and inspection, is to undertake some kind of bibliometric analysis.

Although the use of bibliometric tools applied to entrepreneurship research is not new—several high-quality studies have been published, most notably in the *Entrepreneurship Theory and Practice*’s 2006 special issue devoted to understanding the scientific structure of entrepreneurship research,² this work stands apart from existing studies in four main aspects: (1) the procedure to select the journals that constitute the ‘relational environment’ of entrepreneurship research; (2) the study of ‘Invisible Colleges’ based on a theoretically well-grounded framework; (3) the representativeness and comprehensiveness of the empirical analysis; and (4) a more up-to-date (2005–2010) empirical analysis of the intellectual structure of entrepreneurship field.

¹ The Entrepreneurship Division of the Academy of Management increased its membership by 230%—more than any other established division—and with over 2,700 members, it now ranks among the largest in the Academy of Management. At the same time, the number of dedicated entrepreneurship journals listed by the Social Science Citation Index increased from one to more than half a dozen, among which the one in the lead has achieved impact factors in the same range as highly respected management and social science journals (Katz 2003; Wiklund et al. 2011).

² Schildt et al. (2006).

The extant literature generally selects their reference journals directly, based on the argument that they are the main outlets for entrepreneurship research (e.g., Romano and Ratnatunga 1996; Ratnatunga and Romano 1997; Casillas and Acedo 2007; Gamboa and Brouthers 2008) or, indirectly, by selecting the journals which have published articles containing the term ‘entrep*’ (Cornelius et al. 2006; Schildt et al. 2006) or ‘entrepreneur*’ (Reader and Watkins 2006) from the Social Science Citation Index (SSCI). Such procedures have, in general, resulted in the selection of a few (often isolated) core entrepreneurship journals, such as *Entrepreneurship Theory and Practice* (ETP), *International Small Business Journal* (ISBJ), *Journal of Business Venturing* (JBV), *Journal of Small Business Management* (JSBM) or *Small Business Economics* (SBE). Hence, other important journals in the area have inevitably been left out. This study makes use of aggregated journal–journal citation relations to delineate the relevant domain (entrepreneurship), following van den Besselaar and Leydesdorff’s (1996) procedure. A set of seven journals were identified following this procedure, representative of the ‘relational environment’ within the field of entrepreneurship research, and enable an in-depth analysis of the issue of invisible colleges: *Entrepreneurship and Regional Development* (ERD), ETP, *Family Business Review* (FBR), ISBJ, JBV, JSBM, and SBE.

The analysis of the invisible college is based on the theoretical model proposed by Zuccala (2006) and further refined in Zuccala and van den Besselaar (2009). Zuccala’s (2006) model focuses on three critical components: subject specialty, scientists as social authors, and the information use environment. Her later work with van den Besselaar proceeded with the stratification of the invisible colleges, from which it was possible to distinguish the various researchers’ roles (e.g., ‘stars’ and influential). The vast majority of the studies within entrepreneurship based on bibliometric or scientometric approaches have not explicitly analyzed the issue of ‘invisible colleges’. Although Reader and Watkins (2006) point out that strong social and collaborative ties are associated with intellectual ties within entrepreneurship research, their analysis left out important dimensions of the invisible colleges, beside the ‘influential authors’, most notably subject specialty, the information use environment, and the researchers’ role within the invisible college. We empirically apply Zuccala’s (2006) model to the entrepreneurship field by explicitly focusing on the three components mentioned above and by identifying the role of researchers (Zuccala and van den Besselaar 2009).

The few existing studies on entrepreneurship that have analyzed the scientific structure of the field rely on rather sophisticated bibliometric techniques, namely Author Co-Citation Analysis (ACA). However, in the vast majority of the cases (e.g., Cornelius et al. 2006; Reader and Watkins 2006; Schildt et al. 2006), the underlying bibliographic database was the SSCI. A real and problematic feature of SSCI is that (co)citation data can only be collated for first authors. As such, researchers who collaborate with others but who do not obtain first authorship are not represented. This is likely to undermine or severely weaken any analysis of ‘influential authors’ (and their roles), a key component of an invisible college. The present paper overcomes this limitation by using SciVerse Scopus as the bibliographic database.³ This database also offers author profiles which cover affiliations, number of publications and their bibliographic data, references and details on the number

³ Scopus, officially named SciVerse Scopus, is a bibliographic database containing abstracts and citations for scholarly journal articles. It is owned by Elsevier and is provided on the Web for subscribers. Searches in Scopus incorporate searches of scientific web pages through Scirus, another Elsevier product, as well as patent databases.

of citations each published document has received, enabling a more comprehensive and thorough analysis of influential authors within a field.

Finally, we argue that the (bibliometric) analysis of the intellectual structure of entrepreneurship research in a more recent period (2005–2010) may prove a useful endeavour. Indeed, citation involves an intrinsic delay. This problem is even more severe in the case of the more sophisticated techniques for mapping disciplinary development in intellectual space, such as ACA (Watkins and Reader 2004). Existing works in this domain analyzed periods earlier than 2004, with the bulk of these studies (e.g., Cornelius et al. 2006; Grégoire et al. 2006; Reader and Watkins 2006; Schildt et al. 2006) resorting to ACA. This means that they may refer to the intellectual structure at best some 6–8 years previously (Watkins and Reader 2004), that is, in the late 1990s. Given the convergence–divergence cycles in terms of disciplinary anchors experienced by the field from the early 1980s to early 2000s (Grégoire et al. 2006), and the fact that some debate still persist regarding the collaboration density of the entrepreneurship community (Reader and Watkins 2006; Campbell 2011), a more up-to-date analysis seems to be required.⁴

The paper is structured as follows. “Modelling the invisible colleges: a brief theoretical review” section briefly details the concept of invisible college, and describes Zuccala’s (2006) model. “Methodological considerations” section focuses on the description of the data and methodological considerations, and the following section (“The (in)visible college(s) within the field of entrepreneurship: empirical results” section) empirically analyzes the three main components of an invisible college—scientists as social authors (“influential authors”), subject specialty, and the information use environment—in the field of entrepreneurship research. Finally, the main conclusions of the study are drawn and discussed.

Scholars are fascinated with the invisible college... but they do not seem to agree precisely on what an invisible college is. (Zuccala 2006, p. 152)

Modelling the invisible colleges: a brief theoretical review

The term “invisible colleges” was introduced in 1645 by Robert Boyle (Wallace 2007), when the Royal Society of London was founded, as a way to describe the fact that its members, although lacking a formal institution or college, were geographically close and shared common scientific interests (Lievrouw 1989; Zuccala 2006). Price (1963) recovered the terminology and applied it to the existence of informal communication networks among scholars from several institutions, often geographically separated from one another. An invisible college was defined as a hierarchical and elitist group of scholars, supported by an expectable inequality and a high level of connection (Price 1971). Crane (1972), influenced by Price’s work, proceeded with a comprehensive examination of the invisible college phenomenon. Focusing on communication among scientists, the author expanded the scope of the concept of informal communication, to include informal discussions, relationships between teachers and students during thesis preparation, and the influence of a scientist’s work on another. The study consisted in an analysis of the growth of

⁴ Campbell (2011, p. 44) argues that “[t]he academic community is geographically very dispersed and therefore has, at best, superficial social/spatial cohesion; collaboration tends to focus exclusively on task”, whereas Reader and Watkins (2006, p. 417) state that the entrepreneurship community encompasses “real and robust social and collaborative networks underlying the generation of the work which is cited jointly by third parties”.

communication relations between sociologists and mathematicians, sustained by survey data collected on co-authorship patterns and exchange of preprints (Zuccala 2006).

Despite Crane's major scientific contribution, Lievrouw (1989) pointed out some limitations to the work, particularly with respect to the definition of invisible college and the lack of real information about informal communication. For Lievrouw (1989, p. 622), it was a paradox that "the term invisible college describes an informal communication process, yet researchers look for it in formal social structures and documents" and defined an invisible college as "a set of informal communication relations among scientists or other scholars who share a specific common interest or goal".

Combining both approaches, Zuccala (2006, p. 155) emphasized the need to understand the multifaceted nature of the invisible college, proposing the following definition:

An invisible college is a set of interacting scholars or scientists who share similar research interests concerning a subject specialty, who often produce publications relevant to this subject and who communicate both formally and informally with one another to work towards important goals in the subject, even though they may belong to geographically distant research affiliates.

The novelty in this latter definition is its openness to the possibility of combining different types of analysis—bibliometric, sociometric and qualitative—in the study of invisible colleges, benefiting from their unique contributions. An invisible college is thus a consequence of an interrelationship (through formal and informal communication) between three key elements: subject specialty, the social actors and information use environment. The first informs the invisible college of its disciplinary rules and research problems, the second refers to the scientific scholars who understand and agree to the rules and interact with one another to solve problems, and the third and last element, represents the scientific workspace, i.e., the "set of elements that affect the flow and use of information messages into, within, and out of any definable entity" (Taylor 1986, p. 3).

The social actors, i.e., the most influential authors, make use of the invisible college to support their search for information and sharing patterns (informal communication) and reinforce the invisible college through bibliometric artefacts (formal communication). Therefore, Zuccala (2006, p. 8) concludes that the invisible college is an organizational structure produced by "the space that intersects the information use environment, the subject specialty and the social actors".

Past bibliometric or scientometric studies related with invisible colleges (for a survey, see Zuccala 2006) show that scientists involved in these networks typically carry out research within a subject specialty made up of subtopic areas with authors clustered together, i.e., they are highly (co)cited, according to shared research interests. The subject specialty, rooted in published documents, is a structural component of the invisible college.

According to Price (1986), an invisible college is a set of 'elite' researchers/scholars from different research affiliates who belong to an 'in-group' of approximately 100 individuals. These elite scholars contribute 'materially', through the production of published documents, to the subject specialty both at national and international levels (Price 1986). It is important to note that an invisible college can exist within a subject specialty, but a subject specialty is not necessarily an invisible college (Price 1963, 1986; Hagstrom 1970).

The formal and informal networks associated to an invisible college often arise and increase in density when there is a need for researchers to share human, financial and technical resources, that is, share the same information use environment—a school or a working space (in other words, the same professional affiliation). As Tuire and Erno (2001) document, co-authorships or collaboration networks among researchers from an invisible

college have been found within university departments. We further argue that these are likely to be common among researchers that were part of the same working environment sometime in the past (former affiliations) and/or for some period of time shared the same working space (i.e., visiting or PhD links). Thus, as Zuccala (2006, p. 156) underlines, “it is important ... to recognize ... that [an invisible college] is not a one-dimensional construct, but rather a multifaceted phenomenon”.

Methodological considerations

Delineating the field of entrepreneurship: the choice of the relevant set of journals

In order to select the set of relevant journals that constitute the field of entrepreneurship research, and thus provide a more systematic method for the choice of journals which are the basis of forthcoming analyses, we follow closely the methodology proposed and implemented by van den Besselaar and Leydesdorff (1996) in their mapping of the field of Artificial Intelligence research.⁵ These authors, in line with previous studies (e.g., Doreian and Fararo 1985; Borgman and Rice 1992), consider that aggregated journal–journal citation relations is an appropriate indicator for the disciplinary organization of the sciences. Accordingly, one would expect strong citation relations within and among journals belonging to a given discipline, and less so with regard to other journals. Moreover, journals belonging to the same ‘subject specialty’ relate (through citation patterns) to existing knowledge in a different way than other journals (van den Besselaar and Leydesdorff 1996).

Thus, we use citation relations among journals to delimit the relevant domains, using the structural approach to analyze the development patterns. However, whereas van den Besselaar and Leydesdorff (1996) use a single journal (*Artificial Intelligence*) to define the relevant journal set, we use three entrance journals on entrepreneurship: *Entrepreneurship Theory and Practice* (ETP); *Journal of Business Venturing* (JBV) and *Small Business Economics* (SBE).⁶ Note that, differently from van den Besselaar and Leydesdorff (1996), who intended to map and study the evolution of a given area, our aim is to achieve a set of journals which permit an encompassing and rigorous analysis of entrepreneurship research. In this vein, the consideration of three entrance journals instead of one seeks to avoid a potential bias and/or omission in the final set of the selected journals which will constitute the basis of our bibliometric analysis.

In a first stage, and for each entrance journal considered, all journals that were related to the given journal (ETP, JBV or SBE) are drawn into the analysis. Then, in a second stage, the citation matrix for the set of journals obtained is constructed using *Journal of Citation Report* (JCR) data.⁷

To accommodate any potential change in the relational mapping of journals we opted to collect and analyze the citation matrixes of the last 5 years for which information was available (2005–2009).

⁵ The author deeply thanks one of the referees for proposing such an insightful method which helped to mitigate the dependence of results on the choice of entrance journals.

⁶ These three journals stand as the top three (Level I journals) in the John Carroll University Classification (Katz and Boal 2006). Fried (2003) also documents that these three journals were the most highly-ranked journals by a set of leading scholars in the field of entrepreneurship.

⁷ JCR is a database of ISI Web of Knowledge.

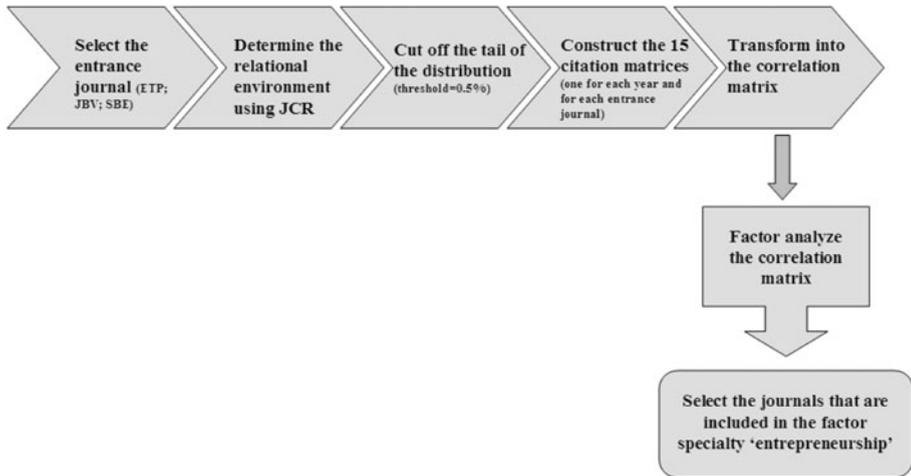


Fig. 1 Algorithm employed to find the relevant journal set for the field of entrepreneurship. *ETP* Entrepreneurship Theory and Practice; *JBV* Journal of Business Venturing; *SBE* Small Business Economics. *Source:* Adapted from van den Besselaar and Leydesdorff (1996, p. 418)

For each entrance journal (ETP; JBV; SBE) and year (2005; 2006; 2007; 2008; 2009), the corresponding ‘cited journal data’⁸ and ‘citing journal data’⁹ were gathered manually from the Journal of Citation Report (JCR). Combining the ‘cited’ and ‘citing’ dimensions and taken the list of journals that account for at least 0.5% of all citations in each year for each seed journal, it was possible to obtain the citation environment of the selected seed journal. Departing from the set of journals that constitutes the citation environment of a given seed journal the citing matrix¹⁰ was then constructed (for each of the 5 years), which represents “the active reproduction of the structure of the specialty ... [that is,] the aggregation of communications among the scientists involved” (van den Besselaar and Leydesdorff 1996, pp. 418–419).

After transforming the citation matrices into correlation matrices, we factor analyzed these correlation matrices and, finally, based on the output of the factor analyses, were able to obtain the set of relevant journals that are included in the specialty of ‘entrepreneurship’—Fig. 1 summarizes the algorithm followed.

The Online Appendix provides an example of the citing matrix (Table A1) for the seed journal ETP, in 2009, and the output of the factor analysis (Table A2) for the three entrance journals (ETP, JBV and SBE) and for all the years covered (2005–2009).

In line with van den Besselaar and Leydesdorff (1996), we consider that the factor on which the entrance journal (e.g., ETP/JBV/SBE) has the highest factor loading represents

⁸ Number of times the articles published in a given year (e.g., 2009) in a set of journals were cited articles published in the entrance or ‘seed’ journal (e.g., ETP, JBV or SBE).

⁹ Number of times the articles published in a set of journals were cited in the entrance or ‘seed’ journal (e.g., ETP, JBV or SBE) in a given year (e.g., 2009).

¹⁰ In order to obtain the citation matrix of the seed journal X (ETP, JBV or SBE) in the year T (2005; ...; 2009), we had to gather the citing data of each journal belonging to the citation environment of that seed journal—in the case of ETP, the average number of journals included in the citation environment was 24 (minimum of 21 in 2008 and a maximum of 27 in 2006), whereas the corresponding average was 29 for JBV (minimum of 25 in 2006 and a maximum of 36 in 2008), and 32 for SBE (minimum of 29 in 2009 and a maximum of 35 in 2006). Given that this procedure was done manually, it was rather demanding and time-consuming task.

Table 1 Delineating the field of entrepreneurship—summary of the factor analysis

Factor analysis component	2005	2006	2007	2008	2009
ETP	ETP ; ISBJ; JBV; JSBM; SBE	ERD; ETP ; ISBJ; JBV; JSBM; SBE	ERD; ETP ; FBR; ISBJ; JBV; JSBM; SBE	ETP ; FBR; ISBJ; JBV; JSBM	ERD; ETP ; FBR; ISBJ; JBV; JSBM; SBE
ENT (B)				ERD; SBE	
ENT (ECO)					
ENT (PSY)	ERD				
JBV	ERD; ETP; ISBJ; JBV ; JSBM; SBE	ERD; ETP; ISBJ; JBV ; JSBM	ERD; ETP; SBR; ISBJ; JBV ; JSBM; SBE	ETP; FBR; ISBJ; JBV ; JSBM	ERD; ETP; FBR; ISBJ; JBV ; JSBM; SBE
ENT (B)				ERD; SBE	
ENT (ECO)					
ENT (PSY)					
SBE	ERD; ETP; ISBJ; JBV; JSBM; SBE				
ENT (B)		ERD; ETP; ISBJ; JBV; JSBM	ERD; ETP; IFBR; SBJ; JBV; JSBM	ERD; ETP; IFBR; SBJ; JBV; JSBM	ERD; ETP; IFBR; SBJ; JBV; JSBM SBE
ENT (ECO)		SBE	SBE	SBE	SBE
ENT (PSY)					

Note: The figure was drawn up based on the results detailed in Table A2 in the Online Appendix

ENT Entrepreneurship; *B* Business; *ECO* Economics; *PSY* Psychology; *ERD* Entrepreneurship and Regional Development; *ETP* Entrepreneurship Theory and Practice; *FBR* Family Business Review; *ISBJ* International Small Business Journal; *JBV* Journal of Business Venturing; *JSBM* Journal of Small Business Management; *SBE* Small Business Economics

the subject specialty which we are attempting to delineate (i.e., ‘entrepreneurship’). The other factors resulting from the analysis can be interpreted as the specialties that are relevant to, or related to, the focal specialty.

Although the output of the factor analysis for the seed journal *Small Business Economics* (SBE) differs from that of *Entrepreneurship Theory and Practice* (ETP) and *Journal of Business Venturing* (JBV), the set of relevant journals associated with ‘entrepreneurship’, both in Business/Management and Economics factor loadings (cf. Table 1—for details see Table A2 in the Online Appendix), are relatively stable for the whole period analyzed and encompasses seven journals: ERD, ETP, FBR, ISBJ, JBV, JSBM, and SBE. Thus, we argue that these seven journals comprise the ‘relational environment’ of the subject specialty ‘entrepreneurship’, constituting the set of relevant journals to analyze the corresponding invisible college.

Citation data-gathering procedure

Five of the seven relevant journals which map the field of entrepreneurship started publishing in the 1980s (ERD; FBR; ISBJ; JBV; SBE). The JSBM and ETP are older, having started publication back in the early 1960s and mid-1970s, respectively (cf. Table 2).

A citation analysis was performed for the six year period, 2005–2010 as “... this time frame appears to be large enough window to balance out any single year anomalies, but not

Table 2 Description of the set of relevant journals included in the delineation of entrepreneurship field

	Year of creation	Impact Factor 2009	ISI areas		2005–2010			
					Number of articles published	Number of references cited	Average citation per article	
<i>Entrepreneurship and Regional Development</i> (ERD)	1989	1.020	B		P&D	139	10,325	74.3
<i>Entrepreneurship Theory and Practice</i> (ETP) ^a	1976	3.230	B			282	18,557	65.8
<i>Family Business Review</i> (FBR)	1988	1.881	B			118	6,156	52.2
<i>International Small Business Journal</i> (ISBJ)	1982	1.661	B		M	151	9,570	63.4
<i>Journal of Business Venturing</i> (JBV)	1985	2.260	B			227	15,507	68.3
<i>Journal of Small Business Management</i> (JSBM)	1961	1.088			M	171	9,761	57.1
<i>Small Business Economics</i> (SBE)	1989	1.380	B	ECO	M	326	15,548	47.7
All						1,414	85,424	60.4

Note: ^a Before 2002 this journal was called ‘*American Journal of Small Business*’

Sources: Author’s computation based on data gathered from Scopus database (number of articles and citations) and ISI Web of Science (Impact Factor)

B Business; ECO Economics; M Management; P&D Planning & Development

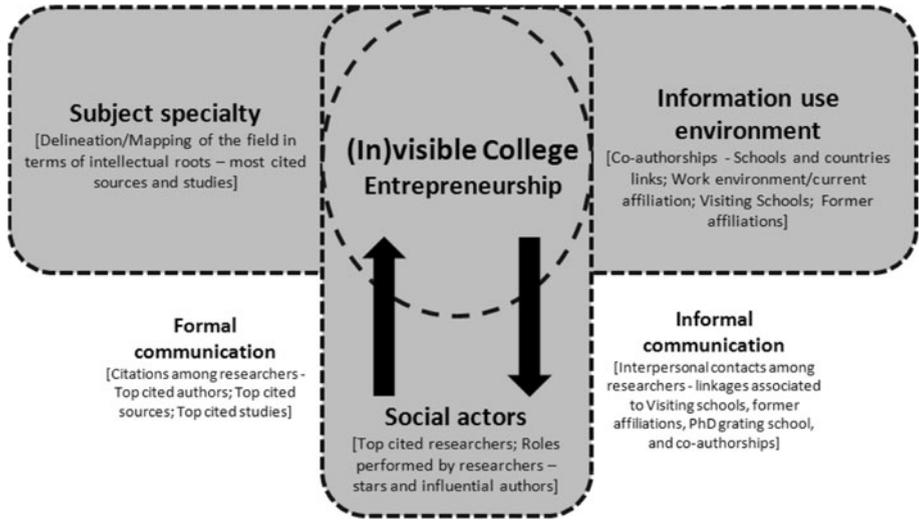


Fig. 2 Operationalization of the main components of an Invisible college. *Source:* Adapted from Zuccala (2006)

so large that the time frame’s relevance can be questioned” (Werner and Brouters 2002, p. 584). Give that the number of issues per year varies among the selected journals (4 in the case of ERD; FBR and JSBM; six in the case of ETP, JBV and ISBJ; and eight in the case of SBE), the number of articles published in the period considered also differs, reaching a maximum of 326 in the case of SBE and a minimum of 118 for FBR.

In total, we gathered about 85,000 references (cited in the 1414 articles published in the set of journals from 2005 to 2010) from the Scopus database,¹¹ where almost sixty per cent belong to ETP (22%), JBV (18%), and SBE (18%). Based on the corresponding citations, three distinct yet complementary rankings were constructed for each journal: (1) the top-50 most-cited authors; (2) the top-50 most-cited source titles (e.g., journals, books, reports), and (3) the top-25 most-cited studies.

Once the key authors had been identified, it was then possible to explore whether there were similarities among the journals with regard to the leading or ‘influential’ authors. Gathering additional data on influential authors—co-authors, educational background, research topic and professional affiliation—enables a better mapping of the intellectual groundings and information use environment of the field of entrepreneurship based on the formal and informal relationships among the most-cited authors. Moreover, the top-50 most cited sources and top-25 most cited studies serve to analyze the intellectual roots and scientific structure of the selected journals in terms of subject specialties. Such a procedure provides the fundamental tools to perform an in-depth analysis of the invisible college(s) of entrepreneurship, having as a basis an operationalized version of Zuccala’s (2006) proposed theoretical framework for invisible colleges (cf. Fig. 2).

¹¹ Preference was given to Scopus, a more recent bibliographic database from Elsevier, instead of the more widely used database, the ISI Web of Knowledge, because although both are similar in coverage for the period analyzed (2005–2010), the former (Scopus) provides the name of all (co)authors of the cited studies, whereas ISI only supplies the name of the first author, limiting substantially a comprehensive analysis of top-cited authors in a given field.

What if we have been thinking about entrepreneurship the wrong way? What if we temporarily suspend our thinking of it as a sub-discipline of economics or management...? (Sarasvathy and Venkataraman (2011, p. 114)

The (in)visible college(s) within the field of entrepreneurship: empirical results

Influential authors

Citations are in general taken as an observable indicator for the latent concept of “scholarly influence” or “scientific impact” (Ravallion and Wagstaff 2011).¹² In a rather innovative study on the distinct roles that a researcher might perform within an specialty, Zuccala and van den Besselaar (2009) recall that, although the (co)publication, (co)citation and citation profile is a key determinant of a researcher’s influence within a given specialty, other less ‘formal’, more ‘voluntary’ activities (e.g., paper refereeing, organization of conferences, chairing committees, reviewing papers and books) are also relevant to support a scientific communication system and thus reflect the ‘influence’ that scientists potentially have in their specialties. Recognizing the pertinence of the arguments put forward by Zuccala and van den Besselaar (2009), the present study considers some elements of informality associated with authors, namely qualitative information regarding their CVs (e.g., prizes awarded, editorial roles). Notwithstanding, and in line with Ravallion and Wagstaff (2011), citations are the main indicator of a researcher’s scientific influence within his/her specialty in this study. Thus, our analysis is focused on, using Zuccala and van den Besselaar’s (2009) terminology, ‘stars’ (individuals who are highly co-cited and cited frequently by other specialty members, have an established reputation within the area, are often the recipients of awards) and ‘influential’ researchers (well-published and highly cited individuals whose works are influential to the specialty’s development).¹³

The (1414) articles published from 2005 to 2010 in each selected entrepreneurship journal include the reference (citations) to a huge amount of distinct authors. For instance, the 282 articles published in ETP include 18,187 references that encompass 11,526 distinct (co)authors, who on the whole receive 34,552 citations (cf. Table 3).

It should be noted that that our analysis, in contrast with most of the extant literature in the area of entrepreneurship based on Author Co-citation Analyses (ACA) (e.g., Cornelius et al. 2006; Reader and Watkins 2006; Schildt et al. 2006), includes all the authors of the studies (and not only the first author) and all types of sources, not being limited to journal articles.

Based on the references taken from published papers in the period 2005–2010 in the seven journals that frame the field of entrepreneurship (cf. “Modelling the invisible colleges: a brief theoretical review” section), we gathered the (top 50) most cited authors in the entire area (Table 4) and in each entrepreneurship outlet (Table A3 in Online Appendix), having obtained a rather comprehensive picture of the set of influential authors in the field.

Note that the top-50 most cited authors represent a negligible percentage in the overall set of authors for each journal (well below 1% for the majority of the journals in analysis)

¹² In their paper, Ravallion and Wagstaff (2011) propose and discuss a new approach that is grounded on a theoretical “influence function” representing explicit prior beliefs about how citations reflect influence.

¹³ This does not, however, solve an important problem which consists in identifying the citation threshold above which the researcher is included in the category of ‘influential’ author. Acknowledging this important limitation, we decided to consider a rather conservative approach by computing top-50 most cited authors instead, as most common, top-10 (Frey 2006) or top-25 (Silva and Teixeira 2008) rankings.

Table 3 Brief account on the number of distinct *authors* and corresponding citations in the selected journals for the period 2005–2010

	Number of distinct cited authors ^b	Cited authors' total citations	Number (%) top-50 cited authors [number of citation equal or above X] ^c	Number of citations corresponding to top-50 cited authors	% top authors' citation in total citations
<i>Entrepreneurship and Regional Development</i> (ERD)	81,23	18,140	50 (0.62) [28]	2,257	12.4
<i>Entrepreneurship Theory and Practice</i> (ETP) ^a	11,543	34,552	50 (0.43) [61]	5,353	15.5
<i>Family Business Review</i> (FBR)	4,492	16,150	50 (1.11) [36]	4,273	26.5
<i>International Small Business Journal</i> (ISBJ)	8,398	17,367	53 (0.63) [22]	1927	11.1
<i>Journal of Business Venturing</i> (JBV)	10,454	28,503	52 (0.48) [46]	4,213	14.8
<i>Journal of Small Business Management</i> (JSBM)	8,831	17,943	50 (0.57) [25]	1,839	10.2
<i>Small Business Economics</i> (SBE)	10,135	27,947	51 (0.50) [47]	3,967	14.2
All	37,060	160,247	50 (0.13) [218]	19,065	11.9

Source: Author's computation based on data gathered from the Scopus database

^a Before 2002 this journal was called '*American Journal of Small Business*'

^b Given the existence of authors with the same surname but with initials that are not possible to standardize (as at times authors appear with one initial and at others with two or more initials), it is likely that some error exists in the count of distinct authors and the corresponding citations, by overcounting the number of distinct authors and undercounting each author's citations

^c In some journals instead of 50 (top) authors we have a few more as the 50th item has several authors with an equal number of citations

but the corresponding citations represent, on average and for the seven journals, 13% of the total citations, which reflects the highly skewed distribution of citations (Albarrán and Ruiz-Castillo 2011).

Considering the full set of top-50 most cited authors in each journal, a total of 197 different scholars was obtained (cf. Table 4). The bulk of these authors (67%) are among the top-50 most cited only in one single journal. One author stands at the other extreme, Shaker A. Zahra (University of Minnesota, US), who is in all the top-50 most cited rankings of the (7) journals which map the field of entrepreneurship research. Moreover, there is a restricted set of (8) authors who are among the top-cited in six journals—Danny Miller (University of Alberta and HEC Montréal, Canada), Howard E. Aldrich (University of North Carolina at Chapel Hill, US); Per Davidsson (Queensland University of Technology, Australia); Mike Wright (Nottingham University, UK); Paul Westhead (Durham Business School, UK);

Table 4 Top cited authors in entrepreneurship field

Rank	Author	# ^a	Award ^b	Rank	Author	# ^a	Award ^b
1	Shane, S.	726	2009	42	Birley, S.	241	
2	Chrisman, J.J.	675		43	Kirzner, I.M.	240	2006
3	Zahra, S.A.	623		44	Slevin, D.P.	239	
4	Wright, M.	621		45	Woo, C.Y.	239	
5	Chua, J.H.	606		46	Hambrick, D.C.	237	
6	Audretsch, D.B.	603	2001	47	Baron, R.A.	233	
7	Gartner, W.B.	594	2005	48	Ireland, R.D.	230	
8	Aldrich, H.E.	543	2000	49	Jensen, M.C.	228	
9	Sharma, P.	506		50	Kuratko, D.F.	224	
10	Reynolds, P.D.	493	2004	51	Astrachan, J.H.	223	
11	Davidsson, P.	477		52	March, J.G.	218	
12	Shepherd, D.A.	463		53	Steier, L.P.	217	
13	Westhead, P.	444		54	Granovetter, M.S.	211	
14	Miller, D.	442		55	Greene, P.G.	206	2007
15	Thurik, A.R.	410		56	Delmar, F.	203	
16	Covin, J.G.	407		57	Smyrnios, K.X.	201	
17	Hitt, M.A.	401		58	Daily, C.M.	200	
18	Venkataraman, S.	398		59	Chandler, G.N.	197	
19	Barney, J.B.	393		60	Gompers, P.A.	186	
20	Eisenhardt, K.M.	376		61	Lockett, A.	183	
21	Sapienza, H.J.	374		62	Katz, J.A.	182	
22	Storey, D.J.	373	1998	63	Schulze, W.S.	182	
23	Macmillan, I.C.	362	1999	64	Burt, R.S.	181	
24	Lubatkin, M.H.	351		65	Powell, W.W.	181	
25	Busenitz, L.W.	346		66	Ward, J.L.	180	
26	Cooper, A.C.	343	1997	67	Vishny, R.W.	175	
27	Autio, E.	332		68	McGrath, R.G.	173	
28	Shleifer, A.	327		69	Ram, M.	173	
29	McDougall, P.P.	325		70	Levinthal, D.A.	171	
30	Brush, C.G.	312	2007	71	Williams, M.L.	171	
31	Lumpkin, G.T.	309		72	Evans, D.S.	169	
32	Porter, M.E.	309		73	Zacharakis, A.	169	
33	Bygrave, W.D.	303		74	Williamson, O.E.	165	
34	Dess, G.G.	300		75	Hannan, M.T.	162	
35	Carter, N.M.	286	2007	76	Oviatt, B.M.	162	
36	Wiklund, J.	285		77	Gulati, R.	158	
37	Acs, Z.J.	277	2001	78	Stuart, T.E.	157	
38	Schumpeter, J.A.	274		79	Gimeno-Gascon, F.J.	155	
39	Lerner, J.	252	2010	80	Le Breton-Miller, I.	155	
40	Dino, R.N.	245		81	van Stel, A.J.	155	
41	Johannisson, B.	245	2008	82	Ucbasaran, D.	153	

Table 4 continued

Rank	Author	# ^a	Award ^b	Rank	Author	# ^a	Award ^b
83	Honig, B.	151		123	Simon, H.A.	124	
84	Minniti, M.	151		124	Hoskisson, R.E.	123	
85	Anderson, A.R.	149		125	Smallbone, D.	123	
86	Hisrich, R.D.	149		126	Curran, J.	121	
87	Mitchell, R.K.	149		127	Jack, S.L.	121	
88	Danes, S.M.	148		128	Jovanovic, B.	120	
89	Reeb, D.M.	148		129	Stevenson, H.H.	120	
90	Mason, C.M.	147		130	Uzzi, B.	120	
91	Amit, R.	146		131	Hart, M.M.	119	2007
92	Cohen, W.M.	146		132	Manigart, S.	119	
93	Shaver, K.G.	145		133	Huse, M.	118	
94	Lopez-de-Silanes, F.	144		134	Udell, G.F.	118	
95	Pfeffer, J.	144		135	Carter, S.	117	
96	Sarasvathy, S.D.	143		136	Bandura, A.	116	
97	Klein, S.B.	139		137	Hofstede, G.	116	
98	Litz, R.A.	139		138	Sirmon, D.G.	115	
99	Peng, M.W.	139		139	Davis, J.A.	114	
100	Rajan, R.G.	139		140	Heck, R.K.Z.	113	
101	Bird, B.	138		141	Morck, R.	113	
102	Dalton, D.R.	138		142	Bates, T.	112	
103	Habbershon, T.G.	138		143	Dyer, W.G.	112	
104	Deeds, D.L.	137		144	George, G.	112	
105	Kogut, B.	137		145	Harrison, R.T.	112	
106	Lansberg, I.	133		146	Donaldson, L.	111	
107	Teece, D.J.	133		147	Penrose, E.T.	110	
108	Berger, A.N.	132		148	Portes, A.	110	
109	Baumol, W.J.	131	2003	149	Chell, E.	108	
110	Weick, K.E.	131		150	Wennekers, S.	107	
111	Gatewood, E.J.	130	2007	151	Anderson, R.C.	106	
112	Fritsch, M.	129		152	Locke, E.A.	106	
113	Ghoshal, S.	129		153	Morris, M.H.	106	
114	Hay, M.	129		154	Hoang, H.	105	
115	Folta, T.B.	128		155	Nelson, R.R.	104	
116	Sexton, D.L.	128		156	Handler, W.C.	103	
117	Bruton, G.D.	127		157	Kolvareid, L.	103	
118	Podsakoff, P.M.	127		158	Stafford, K.	103	
119	Fama, E.F.	125		159	Johanson, J.	102	
120	Kellermanns, F.W.	124		160	Mintzberg, H.	102	
121	Krueger, N.F.	124		161	Salvato, C.	102	
122	La Porta, R.	124		162	Smith, K.G.	101	

Table 4 continued

Rank	Author	# ^a	Award ^b
163	Robbie, K.	100	

Note: ^a Citations obtained by summing all the author's citations in the seven journals [in total we have 37,060 distinct authors who received 160,247 citations—about 60% of the authors received only 1 citation whereas 163 authors, who represent 0.44% of the total authors, were cited 100 or more times, covering 21.6% of the total citations]; ^b Global Award for Entrepreneurship Research (in <http://www.e-award.org/web/Hem.aspx>, accessed in April 2011); bold represents the top-50 most cited authors in entrepreneurship (excludes retired/deceased, identified by bold italic); italic represents all the authors that form the (in)visible college of entrepreneurship

Source: Author's computation based on data gathered from the Scopus database

S. Venkataraman (University of Virginia, US); Scott A. Shane (Case Western Reserve University, US); and William B. Gartner (Clemson University, US). Interestingly, five of these top-cited authors do not show up among the top 50 of FBR—Davidsson, Wright, Westhead, Venkataraman, and Gartner. Miller and Aldrich do not appear in the top 50 of SBE and Shane in ISBJ's top-50 ranking, which may indicate a certain degree of specificity (within the entrepreneurship field) of the topics focused on in these outlets.

Taking into account the overall citation figures and the definition (following that of Price's (1986)) proposed in Zuccala and van den Besselaar (2009, p. 112) for an invisible college as a "communication system compris[ing] of approximately 80–100 scientists who are part of the social 'in-group' of a subject specialty", we could, at first glance, speculate that the 'global' invisible college of the entrepreneurship specialty may encompass from 50 ('stars' and 'influential') up to 99 (reasonably influential, including some 'stars') researchers (cf. bold and italic grey cells of Table 4).¹⁴

Among these 99 authors, 17 were awarded the *Global Award for Entrepreneurship Research*: Josh Lerner (2010), Scott Shane (2009), Bengt Johannisson (2008), Candida G. Brush, Nancy M. Carter, Elizabeth J. Gatewood, Patricia G. Greene (Diana Project, 2007), Israel M. Kirzner (2006), William Gartner (2005), Paul D. Reynolds (2004), William J. Baumol (2003), Zoltan J. Acs and David B. Audretsch (2001), Howard E. Aldrich (2000), Ian C. MacMillan (1999), David J. Storey (1998), and Arnold C. Cooper (1997).¹⁵

Apart from theses, the top-10 most cited authors who achieved about 500 or more citations for the full set of journals framing entrepreneurship in the period under analysis (2005–2010), can be classified as 'stars', in the wording of Zuccala and van den Besselaar (2009). Scott Shane and Shaker Zahra have contributed decisively to the conceptualization of the entrepreneurial process (Theory building) (Cornelius et al. 2006), the former as editor of the R&D, Innovation, and Entrepreneurship Division of Management Science and

¹⁴ We excluded from this figure the authors in Table 3 who have died or retired/are not active in the field (e.g., Schumpeter, Cooper, Birley, Kirzner) and those who are highly cited but are not from the area, i.e., 'outsiders' (e.g., Porter, Lerner, March, Granovetter, Williamson, Teece).

¹⁵ Since its inception, in 1996, the *Global Award for Entrepreneurship Research* (before 2009, *International Award for Entrepreneurship and Small Business Research*) has become firmly established as the foremost global award for research on entrepreneurship (Henrekson and Lundström 2009). According to Henrekson and Lundström (2009, p. 11), "a prize-worthy contribution needs to be original and influential... a contribution is influential, notably through its impact on subsequent scientific work..., by furthering entrepreneurship as a field..., by furthering entrepreneurship education and training at the academic level, and by influencing policy-making and society more broadly."

member of the Editorial Board of SBE, and the latter serving on the Editorial Board of FBR and Board of Review of JBV and JSBM.¹⁶ James Chrisman (Mississippi State University, US), Jess H. Chua (University of Calgary, Canada), and Pramodita Sharma (Concordia University, Canada) form a closely knit group of researchers on corporate entrepreneurship and venturing associated more specifically to family businesses whose influence within the field of entrepreneurship is paramount—Chrisman is senior editor of ETP (was editor between 2003 and 2011) and field editor of JBV, Chua is the editor of ETP and Sharma the editor of FBR. Mike Wright, former editor of ETP and joint editor of *Journal of Management Studies*, also conducts research in corporate entrepreneurship and venturing. An analysis of the entrepreneurial networks and resource accumulation and the characteristics of entrepreneurs link another three ‘stars’: Aldrich, Paul Reynolds (George Mason University, US) and Gartner. The latter two were co-founders of the Entrepreneurship Research Consortium, which initiated, developed and managed the Panel Study of Entrepreneurial Dynamics (PSED), with Reynolds as the founding coordinator of the Global Entrepreneurship Monitor research program.¹⁷ Aldrich is the editor-in-chief of Entrepreneurship Research Journal. Finally, David B. Audretsch (Indiana University, US), more focused on the societal consequences of entrepreneurship, namely issues related with innovation and regional policy, is co-editor and founder of SBE.¹⁸

Assuming that the similarity of ranks among the top-cited authors for each journal may reveal some (hidden) common characteristics in terms of their scientific intellectual structures, factor analysis was applied to the ranks of the 197 top-cited authors by journal to examine whether the selected journals are linearly related to a smaller number of unobservable factors.

The output of the factor analysis reveals that the selected journals form three distinct groups (cf. Fig. 3): the largest one, including the journals EDR, ETP, JSBM and ISBJ, a second one with SBE and JBV (this journal also loads fairly in the first component, which may reflect its wider/more diversified focus), and a third comprising only FBR. Such evidence suggests that although the field of entrepreneurship seems to constitute a cohesive (in)visible college, as a reasonable number of scholars achieve high citation rates in the majority of the journals mapping entrepreneurship, there are some signs of fragmentation and specialization which could mean that such a college encompasses a few emergent subject specialties, namely those related with family businesses (FBR) and innovation, technology and policy (SBE and JBV).

Subject specialty

Citing patterns are produced by a collective of authors publishing in a certain source (e.g., journals, books, reports) in a given year (Vieira and Teixeira 2010). These patterns reveal how this community perceives its relevant environments at the time (Borgman and Furner 2002). Bibliometric or scientometric studies show that researchers involved in invisible college networks typically carry out research within a subject specialty or field (Zuccala

¹⁶ Shaker Zahra has received several awards for his excellent service and teaching, including the Best teacher in the MBA and the Mentor Award from the Entrepreneurship Division, the Academy of Management.

¹⁷ William Gartner also serves on the Board of Review of JBV and JSBM.

¹⁸ He is also Associate Editor of *The Annals of Regional Science*, *Journal of Policy Analysis and Management*, *International Journal of Technology Transfer and Commercialisation*, *International Journal of Biotechnology*, and *International Journal of Industrial Organization*.

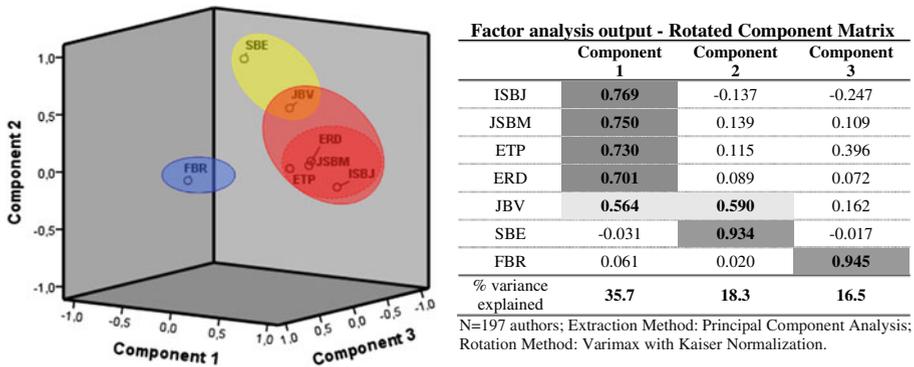


Fig. 3 Similarities among the selected set of entrepreneurship journals with regard to *influential authors*. *Note:* The rankings of all (197) top-50 most cited authors of each selected journal were gathered and then a factor analysis on these journals' author rankings was computed. *ERD* Entrepreneurship and Regional Development; *ETP* Entrepreneurship Theory and Practice; *FBR* Family Business Review; *ISBJ* International Small Business Journal; *JBV* Journal of Business Venturing; *JSBM* Journal of Small Business Management; *SBE* Small Business Economics. *Source:* Author's computation

2006). 'Fields' may be defined at various levels, from small research fronts to broad academic disciplines (Zitt 2006). The delimitations of scholarly fields are a fairly popular subject within scientometrics (Vieira and Teixeira 2010), and a vast amount of high-quality literature has been dedicated to it (e.g., Leydesdorff 2002, 2004, 2008; Leydesdorff and Cozzens 1993; Leydesdorff and Zhou 2007).

The present study seeks to delimit the field of 'entrepreneurship' based on van den Besselaar and Leydesdorff's (1996) aggregate journal–journal citation method. However, conducting citation studies at the disciplinary level overlooks a considerable degree of heterogeneity underlying every subject (Rigney and Barnes 1980; Clements and Wang 2003; Waller 2006). Most specialties are made up of subtopic areas with authors clustered together according to shared research interests (e.g., Raeder and Watkins 2006; Schildt et al. 2006; Zuccala 2006).

Thus, after having delimited entrepreneurship to a set of seven journals (cf. "Delimiting the field of entrepreneurship: the choice of the relevant set of journals" section), the first step consisted in analyzing the journals' intellectual basis, in other words, which are the most important sources that they have relied upon (i.e., the most highly cited sources). Then, in a second step, we assessed the extent to which each of these journals share commonalities in terms of their intellectual basis by classifying for each journal its top-50 cited sources in terms of ISI-based scientific areas,¹⁹ and statistically determining (through factor analysis) how similar the distribution of the sources' rankings are among the journals.

Although for the global set of journals in analysis the bulk of sources cited (around ¾, if we exclude FBR) are books, reports and other non-published material, the weight of

¹⁹ Using the ISI classification of scientific areas, demarking from the Business and Management (B&M) the specialty of Entrepreneurship (ENT), we considered 8 distinct 'specialties' or research subjects: Entrepreneurship (ENT), Business and Management (B&M), Economics (ECO), Sociology (SOC), Psychology (PSY), Finance (FIN), Planning and Development (P&D), and Labour and Education (L&E). It is important to note that Business and Management (B&M) includes Innovation, Marketing and Organization fields of research, whereas Accounting is included in Finance (FIN).

Table 5 Brief account on the number of distinct *sources* and corresponding citations in the selected journals for the period 2005–2010

	Number of distinct cited sources [% journals]	Cited sources' total citations [% journals]	Number (%) top-50 cited sources [number of citations equal or above X] ^b	Number of citations corresponding to top-50 cited sources	% top sources' citation in total citations
<i>Entrepreneurship and Regional Development</i> (ERD)	3,904 [24.1]	9,961 [61.3]	52 (1.3) [19]	3,978	39.9
<i>Entrepreneurship Theory and Practice</i> (ETP) ^a	4,793 [22.7]	18,187 [70.6]	50 (1.0) [33]	9,907	54.5
<i>Family Business Review</i> (FBR)	511 [43.1]	1,642 [84.7]	56 (10.0) [4]	1,149	70.0
<i>International Small Business Journal</i> (ISBJ)	3,300 [30.4]	9,361 [67.6]	50 (1.5) [23]	3,988	42.6
<i>Journal of Business Venturing</i> (JBV)	4,010 [26.0]	15,266 [73.2]	50 (1.2) [31]	8,478	55.5
<i>Journal of Small Business Management</i> (JSBM)	2,114 [25.6]	7,607 [71.4]	51 (2.5) [18]	4,087	53.7
<i>Small Business Economics</i> (SBE)	1,350 [29.4]	41,50 [70.7]	50 (3.7) [13]	2,051	49.4

Source: Author's computation based on data gathered from Scopus database

^a Before 2002 this journal was called 'American Journal of Small Business'

^b In some journals instead of 50 (top) sources we have a few more as the 50th item has several sources with an equal number of citations

citations associated to journal articles amounts to more than 70% of the corresponding total (cf. Table 5). There is a slight variation among the journals as to the weight that journal articles possess in terms of citations, with EDR and ISBJ presenting a smaller weight (61 and 68%, respectively) and FBR the highest (85%).

The top-50 cited sources represent overall about 50% of the total citations (varying from a minimum of 40% in ERD to a maximum of 70% in FBR). Similarly to the top-50 most cited authors, but in a significantly more pronounced way, this reveals a rather skewed distribution of sources citations with less than 2% of the sources being responsible for about 50% of total citations.

The consideration of all top-50 most cited sources in entrepreneurship yields a total of 130 distinct sources (cf. Table 6). The most widely cited source is JBV with over 4,000 citations in the period considered (2005–2010). ETP follows with about 3,000 citations. Few non-journal sources appear on the list, most notably the 'Frontiers of Entrepreneurship Research' series (Rank 24 with 364 citations), and the proceedings from the Babson College Entrepreneurship Research Conference, one of the most prestigious and competitive conferences in the field (Grégoire et al. 2006). Table A4 (in the Online Appendix) lists

Table 6 Top cited *sources* in entrepreneurship field

Global Rank	Source	No. of citations	No. of journals
1	Journal of Business Venturing	4104	7
2	Entrepreneurship Theory and Practice	2913	7
3	Strategic Management Journal	2579	7
4	Academy of Management Review	2080	7
5	Academy of Management Journal	1852	7
6	Administrative Science Quarterly	1325	7
7	Journal of Small Business Management	1118	7
8	Small Business Economics	1066	7
9	Family Business Review	960	6
10	Entrepreneurship and Regional Development	917	7
11	Journal of Management	907	7
12	International Small Business Journal	877	6
13	Organization Science	789	7
14	Journal of Finance	635	6
15	Management Science	635	7
16	Journal of Management Studies	516	7
17	Harvard Business Review	504	7
18	Research Policy	495	6
19	Journal of Financial Economics	491	6
20	Journal of International Business Studies	489	6
21	American Journal of Sociology	464	7
22	American Economic Review	438	7
23	American Sociological Review	378	7
24	Frontiers of Entrepreneurship Research	364	5
25	Journal of Marketing	347	5
26	Journal of Applied Psychology	346	5
27	Journal of Political Economy	279	5
28	Regional Studies	279	4
29	Organization Studies	229	6
30	California Management Review	228	6
31	Quarterly Journal of Economics	211	5
32	Journal of Marketing Research	208	4
33	Academy of Management Executive	189	4
34	Journal of Personality and Social Psychology	168	2
35	Venture Capital: An International Journal of Entrepreneurial Finance	158	3
36	Journal of Business Research	147	5
37	Technovation	135	3
38	Journal of Law and Economics	134	5
39	Psychological Bulletin	128	4
40	Journal of Small Business and Enterprise Development	125	4
41	Journal of Banking and Finance	119	4
42	Advances in Entrepreneurship, Firm Emergence and Growth	107	2

Table 6 continued

Global Rank	Source	No. of citations	No. of journals
43	Journal of Business Ethics	103	3
44	Econometrica	94	3
45	Industrial and Corporate Change	90	3
46	Journal of International Marketing	89	3
47	Annual Review of Sociology	86	3
48	Economic Journal	86	2
49	International Journal of Entrepreneurial Behavior and Research	83	2
50	International Marketing Review	81	3
51	Journal of Developmental Entrepreneurship	78	2
52	European Planning Studies	76	1
53	Human Relations	75	2
54	Journal of Product Innovation Management	75	3
55	Research in Organization Behavior	74	2
56	Handbook of Organization	68	2
57	Sloan Management Review	67	2
58	Journal of Organizational Behavior	65	2
59	Asia Pacific Journal of Management	64	1
60	Journal of Economic Literature	63	2
61	Journal of the Academy of Marketing Science	63	2
62	International Business Review	62	2
63	Organizational Dynamics	60	3
64	European Journal of Marketing	59	2
65	Rand Journal of Economics	50	2
66	World Development	50	1
67	Journal of Industrial Economics	49	1
68	Organizational Behavior and Human Decision Processes	48	1
69	Financial Management	47	2
70	Urban Studies	44	1
71	British Journal of Management	41	1
72	Cambridge Journal of Economics	39	1
73	Global Entrepreneurship Monitor	39	1
74	Journal of Economic Geography	39	1
75	Journal of Accounting and Economics	35	1
76	Economic Geography	34	1
77	Education & Training	34	1
78	The New Institutionalism in Organisational Analysis	33	1
79	The Theory of Economic Development	33	1
80	Industrial Marketing Management	32	1
81	Technology Analysis & Strategic Management	30	1
82	Long Range Planning	29	1
83	Review of Economics and Statistics	29	1
84	Environment and Planning C: Government and Policy	28	1
85	International Journal of Industrial Organization	28	1

Table 6 continued

Global Rank	Source	No. of citations	No. of journals
86	Environment and Planning A	27	1
87	Journal of Accounting Research	27	1
88	Accounting Review	26	1
89	Journal of Evolutionary Economics	26	1
90	Work, Employment and Society	26	1
91	Review of Economic Studies	25	1
92	Understanding the Small Business Sector	25	1
93	Journal of World Business	24	1
94	R&D Management	24	1
95	European Urban and Regional Studies	23	1
96	International Studies of Management and Organization	23	1
97	Journal of Retailing	23	1
98	Management Learning	23	1
99	Personnel Psychology	23	1
100	European Economic Review	22	1
101	Journal of Labor Economics	22	1
102	Journal of Financial Intermediation	21	2
103	Economic Development Quarterly	19	1
104	International Journal of Urban and Regional Research	19	1
105	Progress in Human Geography	19	1
106	Journal of Business	18	1
107	Journal of Corporate Finance	18	1
108	Journal of Human Resources	18	1
109	Journal of Marketing Theory and Practice	18	1
110	Journal of Money	18	1
111	Management International Review	18	1
112	Economics of Innovation and New Technology	17	1
113	International Entrepreneurship and Management Journal	17	1
114	Journal of Development Economics	17	1
115	Review of Industrial Organization	17	1
116	Applied Economics	14	1
117	Journal of Econometrics	14	1
118	Corporate Governance: An International Review	13	1
119	Journal of Economic Behavior and Organization	13	1
120	The Sage Handbook of Organizational Institutionalism	8	1
121	Contemporary Accounting Research	7	1
122	International Journal of the Economics of Business	6	1
123	Industrial Relations	5	1
124	Journal of Financial and Quantitative Analysis	5	1
125	Organizational Research Methods	5	1
126	Accounting Horizons	4	1
127	Accounting, Organizations and Society	4	1
128	Auditing: A Journal of Practice & Theory	4	1

Table 6 continued

Global Rank	Source	No. of citations	No. of journals
129	Industrial and Labor Relations Review	4	1
130	Journal of Business Finance and Accounting	4	1

Note: From the papers published in each selected journal, in the period 2005–2010, the corresponding references/citations (approximately 85,000 citations) were gathered from the Scopus database. These references were treated separately for each of the seven journals—in a first stage these references were harmonized, namely regarding sources' titles; then, in a second stage, we calculated the number of times each source title appeared and thus obtained the respective citations. Journals represent around ¼ of all sources with a corresponding citation share of 72%. The present table was computed from the summing up of the top-50 source titles in each of the seven journals—it resulted in 130 distinct source titles encompassing 5,381 citations (approximately 6% of the total citations)

Source: Author's computation based on data gathered from the Scopus database

all the top-50 most cited sources for each journal ordered by number of citations. There are 17 journals that are common to the seven journals which map the intellectual boundaries of the entrepreneurship field: five belong to the subject specialty of entrepreneurship (ERD, ETP, JBV, JSBM, SBE),²⁰ nine to management/business and organization (in decreasing order of citations: *Strategic Management Journal*, *Academy of Management Review*, *Academy of Management Journal*, *Administrative Science Quarterly*, *Journal of Management*, *Organization Science*, *Management Science*, *Journal of Management Studies*, and *Harvard Business Review*), two from Sociology (*American Journal of Sociology* and *American Sociological Review*), and one from Economics (*American Economic Review*).

Looking separately at the seven journals under analysis, it is apparent that the understanding of issues related to entrepreneurship requires insights from several disciplines, beside Entrepreneurship in itself, namely, Business and Management, Economics, Finance, Sociology, Psychology, Planning and Development, and Labour and Education. This evidence reinforces the factor analysis conducted in “[Modelling the invisible colleges: a brief theoretical review](#)” section to delimit the field of entrepreneurship where hidden factors related to Management, Business, Economics, Technology, Policy, Sociology and Psychology emerged (see Summary Table A2 in the Online Appendix).

The dependence on a diversity of specialties is a common feature among all the journals dedicated to entrepreneurship (cf. Fig. 4), a feature that been substantially highlighted in past studies on entrepreneurship (e.g., Grégoire et al. 2006; Braunerhjelm and Henrekson 2009; Meyer 2011). Although the intellectual roots and structure of entrepreneurship research continues to reveal a large ‘dependence’ on well-established fields of research, namely Business and Management, and (to a lesser extent) on Economics (in the case of SBE), the strong reliance of recently published papers on sources coming from entrepreneurship is undeniable. This seems to reflect a growing tendency for this research area to become more than a mere sub-discipline of management or economics (Saravathy and Venkataraman 2011), broadening its legitimacy as a valid academic research area (Cooper 2003; Venkataraman 1997) with a growing number of researchers dedicated to entrepreneurship as a core research field (Alvarez et al. 2010).

Indeed, comparing this evidence on the intellectual roots of entrepreneurship with similar, earlier studies (e.g., Cornelius et al. 2006, Grégoire et al. 2006, Schildt et al. 2006),

²⁰ The other two core entrepreneurship journals, FBR and ISBJ, appear in all but one (SBE) of the seven journals.

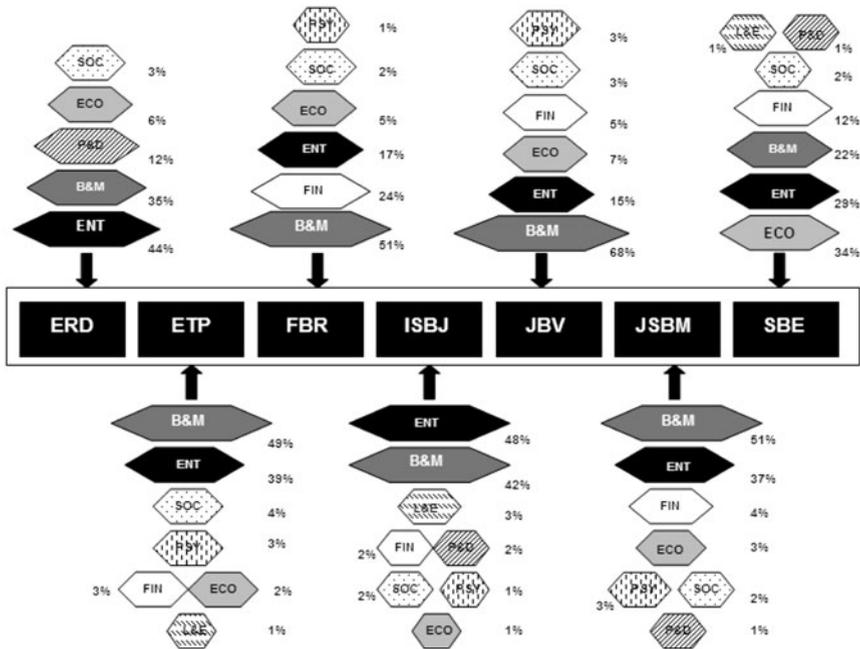


Fig. 4 Intellectual roots of entrepreneurship journals with regard to sources. *Note:* For each selected journal the top-50 most cited sources were computed and then classified into ‘specialties’ using the ISI scientific areas. *ERD* Entrepreneurship and Regional Development; *ETP* Entrepreneurship Theory and Practice; *FBR* Family Business Review; *ISBJ* International Small Business Journal; *JBV* Journal of Business Venturing; *JSBM* Journal of Small Business Management; *SBE* Small Business Economics. *ENT* Entrepreneurship; *B&M* Business and Management; *ECO* Economics; *SOC* Sociology; *PSY* Psychology; *FIN* Finance; *P&D* Planning and Development; *L&E* Labour and Education. *Source:* Author’s computation based on data from Table A5 in the Online Appendix

we could argue that entrepreneurship researchers are becoming increasingly better interconnected as they are “actively engage[d] in the creation of a systematic body of information” (Gartner 2001, p. 35). Thus, as Venkataraman (1997, p. 120, emphasis added) states, even though entrepreneurship scholars approach the subject from different (multidisciplinary) perspectives, “what unites [them] as a *distinct, although invisible, college* is a concern with central issues [understanding how, in the absence of current markets for future goods and services, these have managed to come into existence]”.

Notwithstanding the common feature highlighted above, the different journals framing the field of entrepreneurship differ somewhat with regard to the relative weights of the Entrepreneurship, Business and Management, and Economics subject specialties. For instance, ERD and ISBJ’s ‘core’ subject specialty relies on ‘Entrepreneurship’ (with almost half of the references cited in the published papers from this area), followed closely by ‘Business and Management’. However, ERD is relatively less multidisciplinary than ISBJ, presenting a higher incidence of the Planning and Development and Economics subject specialties. Economics is also important in SBE, although in this case, the weight among Economics (34%), Entrepreneurship (29%), and Business and Management (22%) is not markedly dissimilar. In contrast, scholars publishing in JBV, FBR, JSBM and ETP have relied heavily on the Business and Management field (which includes innovation, marketing and organizational specialties). This reliance is particularly strong in the case of

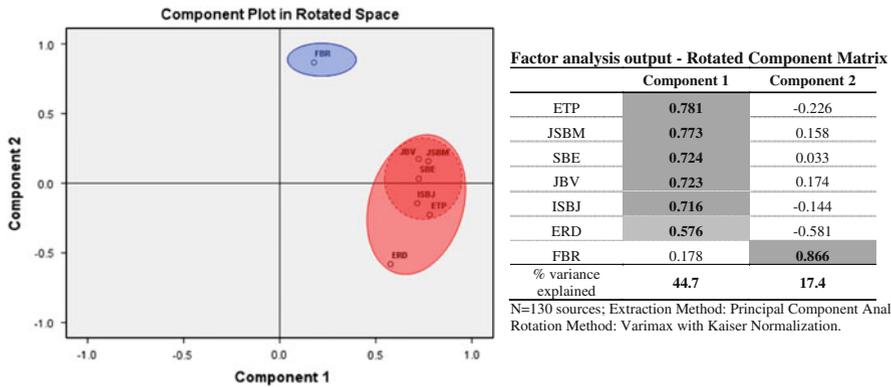


Fig. 5 Similarities among the selected set of entrepreneurship journals with regard to *sources*. *Note:* The rankings of all (130) top-50 most cited sources of each selected journal were gathered and a factor analysis on the journals' sources rankings was computed. *ERD* Entrepreneurship and Regional Development; *ETP* Entrepreneurship Theory and Practice; *FBR* Family Business Review; *ISBJ* International Small Business Journal; *JBV* Journal of Business Venturing; *JSBM* Journal of Small Business Management; *SBE* Small Business Economics. *Source:* Author's computation

JBV and FBR. The latter journal presents a markedly distinct intellectual pattern from the others, considering its Finance and Accounting roots emerge as clearly predominant (24% of the references cited in the papers published in FBR between 2005 and 2010 are from Finance and Accounting, which stand in sheer contrast with the corresponding weight in the other journals—4%, on average).²¹

Such an apparent fragmentation among the journals covering entrepreneurship research suggests a certain degree of specialization that is emerging naturally in a (increasingly) mature field (Gartner et al. 2006).

Again, assuming that the similarity among the ranks of top-cited sources for each journal can reveal some (hidden) common characteristics in terms of their scientific intellectual structures, factor analysis was applied to the ranks of the 130 top-cited sources by journal. The output of the factor analysis (cf. Fig. 5) reveals that the selected journals form two distinct groups: the largest one, covering the journals ETP, JBV, ISBJ, JSBM, SBE, and ERD (this journal with a quite smaller loading), and a second comprising only FBR. Factor analysis also demonstrates that FBR and ERD stand in rather contrasting positions in terms of intellectual roots, with the former relying more on Business & Management and Finance and the latter on Entrepreneurship and Planning & Development.

The analysis of top-cited studies sheds further light on the subject specialty of the (in)visible college, which enables a better understanding of the consolidation of a scientific area (Casillas and Acedo 2007).

The 85,000 references included in the database correspond to a total of approximately 60,000 different studies, of which a very small fraction (around 17%) is cited more than once, ranging from the lowest (14.1%) in ERD and JSBM to the highest (23.3%) in ETP (cf. Table 7). The top-25 most cited studies in each of the seven journals considered involve a rather low citation threshold (the last study in the top-25 of ERD was cited only nine times), reflecting huge dispersion within the literature and, based on the articles

²¹ In order to maintain the number of topic categories low, we included the Accounting-related sources that appear in FBR under the label 'Finance'.

Table 7 Brief account on the number of distinct *studies* and corresponding citations in the selected journals for the period 2005–2010

	Number of distinct studies	Number of total citations	Top-25 most cited studies			Studies that received more than 1 citation		
			Number (% total studies)	% total citations	Citation threshold ^b	Number	% total studies	% total citations
<i>Entrepreneurship and Regional Development (ERD)</i>	8,086	10,325	25 (0.31)	3.2	9	1,143	14.1	32.6
<i>Entrepreneurship Theory and Practice (ETP)^a</i>	11,400	18,577	27 (0.24)	3.7	20	2,652	23.3	52.9
<i>Family Business Review (FBR)</i>	3,893	6,165	30 (0.77)	9.4	14	780	20.0	49.4
<i>International Small Business Journal (ISBJ)</i>	7,531	9,570	28 (0.37)	3.4	8	1,129	15.0	33.1
<i>Journal of Business Venturing (JBV)</i>	10,400	15,507	30 (0.29)	4.1	13	2,106	20.3	46.5
<i>Journal of Small Business Management (JSBM)</i>	7,755	9,761	35 (0.45)	3.9	8	1,091	14.1	31.7
<i>Small Business Economics (SBE)</i>	11,481	15,548	25 (0.22)	3.1	14	1,666	14.5	36.9

Sources: Author's computation based on data gathered from Scopus database

^a Before 2002 this journal was called 'American Journal of Small Business'

^b Number of citation equal or above X (In some journals instead of 25 (top) studies we have a few more, as the 25th item has several studies with an equal number of citations)

published in those journals, a low level of consensus emerges regarding what comprises seminal contributions in a certain domain (Casillas and Acedo 2007). This lack of consensus is more pronounced in ERD, ISBJ, JSBM and less so in ETP.

Despite the low rate of recurrence of cited studies in each of the journals (see Table A5 in the Online Appendix), when we rank the studies for the whole set of journals (cf. Table 8), some works show an extremely high level of influence on more recent entrepreneurship-oriented research. Three studies achieve here the status of 'citation classics', i.e., have gathered over 100 citations (Gartner et al. 2006): Shane and Venkataraman's seminal article, published in *Academy of Management Review* in 2000 ("The promise of entrepreneurship as a field of research"); Schumpeter's classical *The Theory of Economic Development*, and Barney's (1991) article "Firm resources and sustained competitive advantage" published in *Journal of Management*. Shane and Venkataraman's study is an agenda-setting article (Wiklund et al. 2011), and is, at present, by far the most highly cited article of the decade in *Academy of Management Review*.

Table 8 Top cited *studies* in the entrepreneurship field

Rank	Study	Type	No. of distinct journals	Total citations
1	Shane, S., Venkataraman, S. 2000. The promise of entrepreneurship as a field of research. <i>Academy of Management Review</i> , 25 (1), pp. 217–226	J	6	171
2	Schumpeter, J. 1934. <i>The Theory of Economic Development</i> . Boston, MA: Harvard University Press	B	6	124
3	Barney, J.B. 1991. Firm resources and sustained competitive advantage. <i>Journal of Management</i> , 11, pp. 791–800	J	6	123
4	Jensen, M.C., Meckling, M.C. 1976. Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure. <i>Journal of Financial Economics</i> , 3, pp. 305–360	J	5	98
5	Penrose, E. 1959. <i>The Theory of Growth of the Firm</i> . New York: Wiley	B	7	98
6	Granovetter, M. 1985. Economic action and social culture: The problem of embeddedness. <i>American Journal of Sociology</i> , 91 (3), pp. 481–510	J	5	89
7	Cohen, W.M., Levinthal, D.A. 1990. Absorptive capacity: A new perspective on learning and innovation. <i>Administrative Science Quarterly</i> , 35 (1), pp. 128–152	J	6	88
8	Storey, D. 1994. <i>Understanding the Small Business Sector</i> . London: Routledge	B	5	85
9	Davidsson, P., Honig, B. 2003. The role of human and social capital among nascent entrepreneurs. <i>Journal of Business Venturing</i> , 18 (3), pp. 301–331	J	5	81
10	Shane, S. 2000. Prior knowledge and discovery of entrepreneurial opportunities. <i>Organization Science</i> , 11, pp. 448–469	J	5	77
11	Lumpkin, G.T., Dess, G. 1996. Clarifying the Entrepreneurial Orientation Construct and Linking It to Performance. <i>Academy of Management Review</i> , 21 (1), pp. 135–172	J	4	67
12	Venkataraman, N. 1997. The distinctive domain of entrepreneurship research. <i>Advances in entrepreneurship, organization emergence, and growth</i> , pp. 119–138., Katz J. Ed., Greenwich, CT, JAI Press	B	5	67
13	Schulze, W., Lubatkin, M.H., Dino, R.N., Buchholtz, A.K. 2001. Agency relationships in family firms: Theory and evidence. <i>Organization Science</i> , 12 (2), pp. 99–116	J	3	65
14	Burt, R. 1992. <i>Structural Holes, The Social Structure of Competition</i> . Cambridge: Harvard University Press	B	4	59
15	Eisenhardt, K. 1989. Building theories from case study research. <i>Academy of Management Review</i> , 14 (4), pp. 488–511	J	4	59
16	Gersick, K., Davis, J., Hampton, M., Lansberg, I. 1997. <i>Generation to Generation</i> . Boston, MA: Harvard Business School Press	B	3	59
17	Chua, J.H., Chrisman, J.J., Sharma, P. 1999. Defining family business by behavior. <i>Entrepreneurship Theory and Practice</i> , 23 (4), pp. 19–40	J	3	53
18	Pfeffer, J., Salancik, C.R. 1978. <i>The External Control Of Organizations: A Resource Dependence Perspective</i> . Harper and Row, New York	B	3	53

Table 8 continued

Rank	Study	Type	No. of distinct journals	Total citations
19	Gimeno, J., Folta, T., Cooper, A., Woo, C. 1997. Survival of the fittest: Entrepreneurial human capital and the persistence of underperforming firms. <i>Administrative Science Quarterly</i> , 42, pp. 750–783	J	3	52
20	Granovetter, M. 1973. The strength of weak ties. <i>American Journal of Sociology</i> , 6, pp. 1360–1380	J	3	48
21	Miller, D. 1983. The correlates of entrepreneurship in three types of firms. <i>Management Science</i> , 29 (7), pp. 770–791	J	4	46
22	Schumpeter, J. 1942. <i>Capitalism, Socialism and Democracy</i> . New York: Harper	B	4	46
23	Sirmon, D., Hitt, M. 2003. Managing resources: Linking unique resource management and wealth creation in family firms. <i>Entrepreneurship Theory and Practice</i> , 27 (4), pp. 339–358	J	2	46
24	Nahapiet, J., Goshal, S. 1998. Social Capital, Intellectual Capital, and the Organisational Advantage. <i>Academy of Management Review</i> , 23 (2), pp. 242–266	J	3	45
25	Kirzner, I. 1973. <i>Competition and Entrepreneurship</i> . Chicago, IL: Chicago University Press	B	3	44
26	Stinchcombe, A. 1965. Organizations and social structure. <i>Handbook of Organizations</i> , pp. 142–193., Ed. J. G. March. Chicago, IL: Rand McNally	B	2	44
27	Birley, S. 1985. The role of networks in the entrepreneurial process, <i>Journal of Business Venturing</i> , 1 (1), pp. 107–117	J	4	43
28	Habbershon, T., Williams, M., 1999. A resource-based framework for assessing the strategic advantages of family firms, <i>Family Business Review</i> , 12, pp. 1–25	J	2	42
29	Porter, M., 1980. <i>Competitive Advantage</i> , New York, Free Press	B	3	40
30	Anderson, R., Reeb, D., 2003. Founding family ownership and firm performance evidence from the S&P 500, <i>Journal of Finance</i> , 58 (3), pp. 1301–1328	J	1	39
31	Cooper, A.C., Gimeno-Gascon, F.J., Woo, C.Y., 1994. Initial human and financial capital as predictors of new firm performance, <i>Journal of Business Venturing</i> , 9 (5), pp. 371–395	J	3	38
32	Evans, D., Jovanovic, B., 1989. An estimated model of entrepreneurial choice under liquidity constraint, <i>Journal of Political Economy</i> , 97 (4), pp. 808–827	J	2	38
33	Jovanovic, B., 1982. Selection and evolution of industry, <i>Econometrica</i> , 50 (3), pp. 649–670	J	1	38
34	Coleman, J., 1988. Social capital in the creation of human capital, <i>American Journal of Sociology</i> , 94 (Suppl.), pp. S95–120	J	3	37
35	Habbershon, T., Williams, M., MacMillan, I., 2003. A unified systems perspective of family firm performance, <i>Journal of Business Venturing</i> , 18, pp. 451–465	J	2	37
36	Uzzi, B. 1997. Social structure and competition in interfirm networks: The paradox of embeddedness. <i>Administrative Science Quarterly</i> , 42 (1), pp. 35–67	J	3	37

Table 8 continued

Rank	Study	Type	No. of distinct journals	Total citations
37	Sarasvathy, S.D. 2001. Causation and effectuation: toward a theoretical shift from economic inevitability to entrepreneurial contingency. <i>Academy of Management Review</i> , 26 (2), pp. 243–263	J	2	35
38	Yin, R. 1994. Case Study Research. London: Sage	B	2	34
39	Cyert, R., March, J. 1963. A behavioral theory of the firm. Englewood Cliffs, NJ, Prentice-Hall	B	2	33
40	Hair Jr., J.F., Andersen, R.E., Tatham, R.L., Black, W.C. 1995. Multivariate Data Analysis with Readings, Englewood Cliffs, NJ: Prentice Hall International	B	3	33
41	Suchman, M. 1995. Managing legitimacy: strategic and institutional approaches. <i>Academy of Management Review</i> , 20 (3), pp. 571–610	J	2	33
42	Hoang, H., Antoncic, B. 2003. Network based research in entrepreneurship: a critical review. <i>Journal of Business Venturing</i> , 18 (2), pp. 165–187	J	3	32
43	Low, M.B., MacMillan, I. 1988. Entrepreneurship: past research and future challenges. <i>Journal of Management</i> , 14 (2), pp. 139–161	J	2	32
44	Stinchcombe, A. 1965. Social structure and organizations, Handbook of Organization, pp. 142–193., In J. March (Ed.) Chicago: Rand McNally	B	1	32
45	Carney, M. 2005. Corporate governance and competitive advantage in family controlled firms. <i>Entrepreneurship Theory and Practice</i> , 29 (4), pp. 249–265	J	2	31
46	Covin, J., Slevin, D. 1991. A conceptual model of entrepreneurship as firm behavior. <i>Entrepreneurship Theory and Practice</i> , 16 (1), pp. 7–25	J	3	31
47	Podsakoff, P., Organ, D. 1986. Self-reports in organizational research: Problems and prospects. <i>Journal of Management</i> , 12, pp. 531–544	J	2	31
48	Nelson, R., Winter, S. 1982. An Evolutionary Theory of Economic Change. Cambridge, MA: Harvard University Press	B	3	30
49	Baron, R. 1998. Cognitive mechanisms in entrepreneurship: Why and when entrepreneurs think differently than other people. <i>Journal of Business Venturing</i> , 13 (4), pp. 275–294	J	2	28
50	Stiglitz, J.E., Weiss, A. 1981. Credit rationing in markets with imperfect information. <i>American Economic Review</i> , 71 (3), pp. 393–410	J	1	28

Note: From the papers published in each selected journal, in the period 2005–2010, the corresponding references/citations (approximately 85,000) were gathered from the Scopus database. In a first stage the references were harmonized (and the spelling of authors, titles and sources was checked); then, in a second stage, the number of times each study appeared was calculated and the respective citations were thus obtained. These top-50 most cited studies represent approximately 0.08% of total studies and the corresponding citations 3.2% of the total

The corpus of key references from which entrepreneurship scholars have drawn inspiration seems to be increasing in size. As Grégoire et al. (2006) documented throughout much of the 1980s and 1990s, the most-cited theoretical anchors tended to lie outside of entrepreneurship

topic within entrepreneurship. This procedure enabled a better portrayal of both the visible (formal) and invisible (informal) links among the key scholars.

From the map depicting all the co-authorship (formal) links between ‘stars’ and influential authors in entrepreneurship (Fig. 6), it is clear that in the most recent period (2005–2010) entrepreneurship researchers have paid heed to Gartner’s (2001, p. 35) quest for “the creation of an identifiable community of scholars who pursue similar research... being actively engage[d] in the creation of a systematic body of information”.

At least through the lens of the top-50 most cited authors in entrepreneurship, the formal (and informal that result from the formal) links between scholars emerge as reasonably dense both within and among the country blocks represented. US hegemony in entrepreneurship research is notorious, covering 78% (75%) of the top-50 authors (citations), and the relatively small number of countries represented in Fig. 6 supports Campbell’s (2011, p. 44) contention that the entrepreneurship scholarly community has as yet to become truly international and is paved with “language barriers and differing educational endowments”—the linkages are established mainly (and almost exclusively) within and among English-speaking spaces (US, Canada, UK, Australia), where the absence of co-authorship linkages among these spaces/authors and Sweden/Bengt Johansson (until very recently editor of ERD) is quite revealing.

Some clusters of closely linked scholars sharing topic commonalities also emerge²²: theory building/conceptualization of the entrepreneurship field (Gartner, Shane, Venkataraman, Zhara); Family business (Astrachan, Chua, Chrisman, Miller, Sharma, Steier); Ethnic/women entrepreneurship (Aldrich, Brush, Carter, Greene); Innovation, regional and policy (Acs, Audretsch, Reynolds, Storey, Thurik); Corporate entrepreneurship -venture capital (Autio, Davidsson, Sapienza, Westhead, Wiklund, Wright); and the ‘mega’ cluster Corporate entrepreneurship—performance/value creation (Autio, Busenitz, Covin, McDougall, Dess, Hitt, Ireland, Kuratko, Sapienza, Shepherd, Slevin, Westhead, Wright, Zahra).

Further evidence on the existence of distinct ‘communities’ within the entrepreneurship field, namely the emergence of more specific/specialized subject specialties, is apparent when we depict the top-50 most cited authors’ formal linkages by journal (cf. Fig. A1 in Online Appendix). FBR and SBE show the most contrasting picture when compared to that representing the entire entrepreneurship field (Fig. 6). Indeed, the figure from FBR is drastically reduced to the ‘family business’ cluster, geographically concentrated in Canada, with all non-North American spaces disappearing from the network. Regarding SBE, the map includes mainly the relations established between US and UK associated to the ‘Innovation, regional, policy’ cluster with a relatively higher reliance on the Finance (Lerner and the ‘outsider’ Shleifer) and Competitive Strategy (the ‘outsider’ Porter) clusters.

One final and interesting remark regarding formal authors’ linkages: a number of top-cited authors—Zahra, Gartner, Reynolds, Covin, Busenitz, Hitt, and Westhead—perform a truly critical gatekeeper and bridging role within the entrepreneurship field by helping “informal communities of entrepreneurship... [become] visible” (Gartner 2001, p. 35) and cohesive.

Some the abovementioned clusters of topics may have benefited from the fact that their participants share/had shared the same (physical) space: University of Alberta, Canada (Miller and Steier); University of Calgary, Canada (Chua and Sharma, the latter as a PhD student); Babson College, US (Brush and Greene); Indiana University, US (Astrachan and Chrisman; Covin, McDougall and Shepherd); University of Minnesota, US (Zahra and Sapienza). These less visible links are depicted in Fig. 7, which presents additional

²² This rather ad hoc ‘clustering’ by topics was based on the co-authorship linkages and information conveyed by the literature in the area, namely the papers by Cornelius et al. (2006) and Schildt et al. (2006).

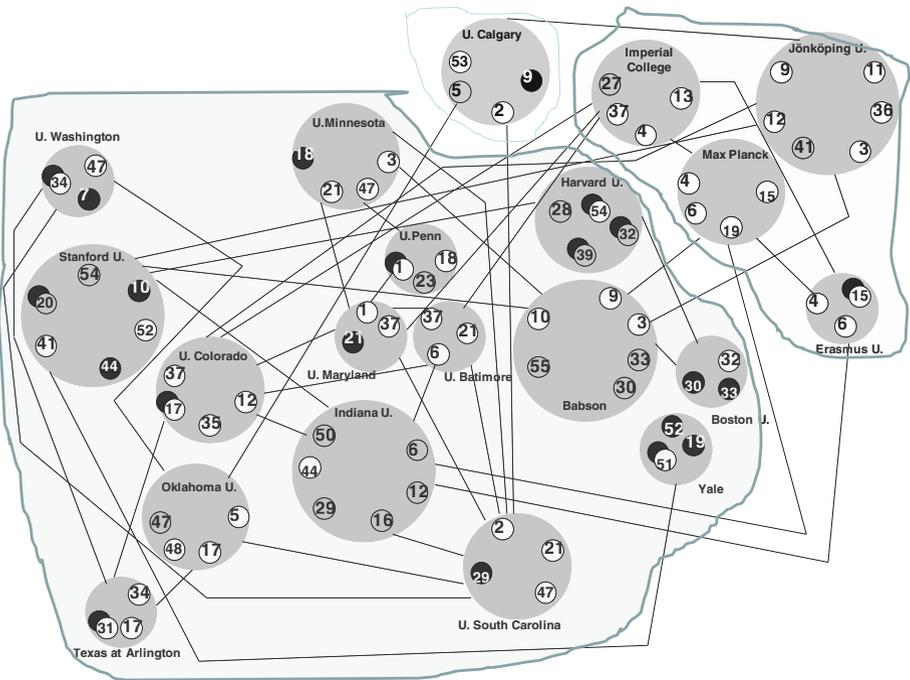


Fig. 7 Mapping the formal (affiliation) and informal (visiting, former affiliations, PhD granting institutions) links among top-cited authors in the field of entrepreneurship. *Note:* Authors are identified with the number corresponding to their global ranking (cf. Table 3); the size of the circles associated to the institutions relate with the number of top-50 cited authors who are connected with that institution. The top-50 cited authors are linked (professionally and through their PhD education) to 197 different institutions. The figure presents those (20, i.e., 10% of the total) institutions which appeared four or more times when we counted current affiliation, former affiliation, visiting posts, and PhD granting institution of the top-50 most cited authors (see Table A6 in Online Appendix). US schools are depicted in an approximate manner according to the corresponding states' geographical location. ○ Visiting or former affiliation; ● current affiliation; ● PhD granting affiliation

information on the 'stars' and most influential authors of entrepreneurship research: current affiliation/employer institution, former affiliations, visiting positions, and PhD granting school.²³

The top-50 most cited authors in the field of entrepreneurship are linked, professionally and through their PhD education, to 197 different institutions. The bulk of these institutions (72%) are associated with only one top-cited author, whereas 10% (the 20 institutions presented in Fig. 7) of these encompass four or more top-cited authors. Around half of these institutions are US-based, 10% from the UK and 6% located in Canada.²⁴ The representativeness of the US (75% of the total) and Europe (20%) is enhanced when we restrict the set of institutions to those that have four or more top-cited authors associated

²³ Detailed information is presented in Table A6 in the Online Appendix. Data was gathered from the Scopus bibliographic database (using the search machine 'Authors' Affiliations') and authors'/organizations' webpages; the authors' current affiliation reports to May 2011.

²⁴ 24 different countries are represented; 1 (0.5%) located in Africa; 10 (5%) in Asia; 65 (34%) in Europe; 3 (1.6%) in Oceania; and 113 (59%) in North America (it was not possible to identify the location of 5 institutions).

with them. Each link in Fig. 7, represented by straight lines, denotes that at least one top-cited author visited, worked or studied (at PhD level) in the two linked institutions.

In terms of the number of top-cited authors' affiliations, Indiana University (US), Babson College (US), Stanford University (US) and Jönköping University (Sweden) stand at the forefront. Their situation however differs with regard to the type of links top authors maintain with them. Almost all the top-cited authors associated with Indiana work there at present—Audretsch (6); Shepherd (12); Covin (16); McDougall (29); and Kuratko (50). This contrasts with Jönköping University (Sweden) where most of the cases refer to Visiting/former affiliation positions—Zahra (3), Sharma (9), Davidsson (11), Shepherd (12), Wiklund (36), with only Johannisson (41) lists it as current affiliation.²⁵ Babson College (US) presents a mixed picture having three top-cited authors affiliated—Brush (30), Bygrave (33) and Greene (55)—and three having reported to have/have had Visiting/former affiliation positions—Zahra (3), Sharma (9) and Reynolds (10). Stanford presents three top-cited authors—Reynolds (10), Eisenhart (20) and Slevin (44)—who obtained their PhD there; two authors—Eisenhart (20) and Granovetter (54)—are current affiliates and the remaining two—Johannisson (41) and March (52)—have/have had visiting posts or were former affiliates.

Some schools, most notably, University of South Carolina (US), University of Colorado (US) and the Imperial College (UK), although not presenting currently affiliated top-cited authors (exception made to Autio (27)), are quite strongly linked to the remaining schools through Visiting and former affiliations.

Two main points result from the evidence depicted in Fig. 7: (1) there is a reasonably dense network of informal links among the key players/schools that are actively engaged in the production of a systematic body of information in the field of entrepreneurship; and (2) the mobility of top-cited authors, through Visiting, former affiliations and PhD studies, is a fundamental piece in maintaining, stimulating and enlarge that network.

Conclusion

Given the increasing scientific, scholarly and public policy relevance of entrepreneurship, in-depth research, based on a theoretically well-grounded framework, on the (in)visible college(s) within this field of research seemed to be of critical relevance. Indeed, the analysis and understanding of the intellectual structure underlying the entrepreneurship (in)visible college(s) can be useful for a wide set of individuals, namely students and academics (Borokhovich et al. 1994; Locke and Perera 2001). In fact, having a map of the conceptual structure of a discipline can be of great interest in order to develop an overview of a field of study, understand the relationships among paradigms, identify the essential works on each one of them, determine which are the most analyzed topics, and which are their conceptual basis (Casillas and Acedo 2007). Moreover, the possibility of summarizing the most relevant literature and the relationships among key works in the area enables researchers to position their research within the field of study (Etemad and Lee 2003) and to identify insightful, influential, and creative research niches in the field of entrepreneurship (Gartner et al. 2006).

Based on the theoretically well-grounded framework underlying Zuccala's (2006) model for the study of invisible colleges, which is anchored in three main pillars— influential authors, subject specialty, and scientific workspace (information use environment),

²⁵ By May 2011 this author was also affiliated to Växjö University (Sweden).

the present paper empirically assessed the existence of (in)visible college(s) in the field of entrepreneurship.

The evidence gathered based on more than a 1,000 articles published, between 2005 and 2010, in a set of journals that delineates the field (*Entrepreneurship and Regional Development, Entrepreneurship Theory and Practice, Family Business Review; International Small Business Journal; Journal of Business Venturing; Journal of Small Business Management; Small Business Economics*) and the corresponding (over) 85,000 references, suggests that there is indeed an (in)visible college in the field of entrepreneurship comprised by approximately 100 individuals, half of whom are classified as ‘stars’ or ‘highly influential’ (Zuccala and van den Besselaar 2009), and are actively engaged in the creation of systematic body of information (Gartner 2001).

More specifically, five main results are worth highlighting.

First, the entrepreneurship field stands as a cohesive (in)visible college. However, its increased path towards maturity, as a scientific field, has been (naturally) accompanied by some signs of fragmentation and specialization, reflected in the emergency of a number of subject specialties, namely those related with family businesses and innovation, technology and policy.

Secondly, a growing tendency within the field to cease to be a mere sub-discipline of management or economics was observed, revealing its greater legitimacy as a valid academic research area with an increasing number of highly cited researchers devoted to entrepreneurship as a core research field—the intellectual roots and structure of entrepreneurship reveal a higher degree of scientific autonomy with stronger (than in the past) reliance on sources coming from the ‘entrepreneurship’ field itself in more recently published papers.

Thirdly, a few top-cited authors—Zahra, Gartner, Reynolds, Covin, Busenitz, Hitt, and Westhead—perform a truly critical gatekeeper and bridging role within the field by helping this community to become more visible and cohesive.

Fourthly, a reasonably dense network of informal relations is evident among highly cited authors and key schools with the mobility of these scholars through visiting, PhD studies and former professional links, helping to sustain the vigour of the network.

Finally, the as yet rather limited internationalization of the entrepreneurship community is apparent. Highly cited entrepreneurship research is concentrated in very few countries (US, UK, Canada, The Netherlands, Sweden and Australia), with indisputable US hegemony. The almost total absence of non-English-speaking authors/studies/outlets is quite revealing of what Campbell (2011, p. 44) termed as marked “language barriers and differing educational endowments”. Thus, internationalization, an essential attribute for a truly networked community, is a challenge (and an opportunity) that should not be overlooked or disguised by the entrepreneurship research area.

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References

Albarrán, P., & Ruiz-Castillo, J. (2011). References made and citations received by scientific articles. *Journal of the American Society for Information Science and Technology*, 62(1), 40–49.

- Alvarez, S. A., Barney, J. B., & Young, S. L. (2010). Debates in entrepreneurship: Opportunity formation and implications for the field of entrepreneurship. *International Handbook Series on Entrepreneurship*, 5(Part 1), 23–45.
- Baumol, W. J. (1968). Entrepreneurship in economic theory. *American Economic Review*, 58(2), 64–71.
- Borgman, C., & Furner, J. (2002). Scholarly communication and bibliometrics. *Annual Review of Information Science and Technology*, 36, 3–72.
- Borgman, C. L., & Rice, R. E. (1992). The convergence of information science and communication: A bibliometric analysis. *Journal of the American Society for Information Science*, 43, 397–411.
- Borokhovich, K. A., Bricker, R. J., & Simkins, B. J. (1994). The streams of financial research and their interrelationships: Evidence from the Social Sciences Citation Index. *Financial Practice and Education*, 4(2), 110–123.
- Braunerhjelm, P., & Henrekson, M. (2009). Awarding entrepreneurship research: A presentation of the Global Award. *Entrepreneurship Theory and Practice*, 33(3), 809–814.
- Campbell, K. (2011). Caring and daring entrepreneurship research. *Entrepreneurship & Regional Development*, 23(1), 37–47.
- Casillas, J., & Acedo, F. (2007). Evolution of the intellectual structure of family business literature: A bibliometric study of FBR. *Family Business Review*, 20(2), 141–162.
- Clements, K. W., & Wang, P. (2003). Who cites what? *Economic Record*, 79(245), 229–244.
- Cooper, A. (2003). Entrepreneurship: The past, the present, the future. In Z. J. Acs & D. B. E. Audretsch (Eds.), *Handbook of entrepreneurship research* (Vol. 1). Boston, MA: Kluwer.
- Cornelius, B., Landström, H., & Persson, O. (2006). Entrepreneurial studies: The dynamic research front of a developing social science. *Entrepreneurship Theory and Practice*, 30(3), 375–398.
- Crane, D. (1972). *Invisible colleges: Diffusion of knowledge in scientific communities*. Chicago: University of Chicago Press.
- Davidsson, P. (2008). *The entrepreneurship research challenge*. Cheltenham: Edward Elgar.
- Davidsson, P., Low, M. B., & Wright, M. (2001). Editor's introduction: Low and MacMillan ten years on—Achievements and future directions for entrepreneurship research. *Entrepreneurship Theory and Practice*, 25(4), 5–15.
- Doreian, P., & Fararo, T. J. (1985). Structural equivalence in a journal network. *Journal of the American Society for Information Science*, 36, 28–37.
- Etemad, H., & Lee, Y. (2003). The knowledge network of international entrepreneurship: Theory and evidence. *Small Business Economics*, 20, 5–23.
- Frey, B. (2006). How influential is economics? *De Economist*, 154(2), 295–311.
- Fried, V. (2003). Defining a forum for entrepreneurship scholars. *Journal of Business Venturing*, 18(1), 1–11.
- Gamboa, E. C., & Brouthers, L. E. (2008). How international is entrepreneurship? *Entrepreneurship Theory and Practice*, 32(3), 551–558.
- Gartner, W. B. (2001). Is there an elephant in entrepreneurship? Blind assumptions in theory development. *Entrepreneurship Theory and Practice*, 25(4), 27–39.
- Gartner, W. B., Davidsson, P., & Zahra, S. A. (2006). Are you talking to me? The nature of community in entrepreneurship scholarship. *Entrepreneurship Theory and Practice*, 30(3), 321–331.
- Grégoire, D. A., Noël, M. X., Déry, R., & Béchar, J.-P. (2006). Is there conceptual convergence in entrepreneurship research? A co-citation analysis of frontiers of entrepreneurship research, 1981–2004. *Entrepreneurship Theory and Practice*, 30(3), 333–373.
- Hagstrom, W. O. (1970). Factors related to the use of different modes of publishing research in four scientific fields. In C. E. Nelson & D. K. Pollock (Eds.), *Communication among scientists and engineers*. Lexington, MA: Lexington Books.
- Henrekson, M., & Lundström, A. (2009). The Global Award for entrepreneurship research. *Small Business Economics*, 32, 1–14.
- Hoang, H., & Antoncic, B. (2003). Network-based research in entrepreneurship: A critical review. *Journal of Business Venturing*, 18, 165–187.
- Katz, J. (2003). Core publications in entrepreneurship and related fields: A guide to getting published. Version 4.1.1. <http://eweb.slu.edu/booklist.htm>.
- Katz, J. & Boal, K. (2006). Entrepreneurship journal rankings. Accessed April 19, 2011, from <http://www.marketingtechie.com/articles/mtart20020307.pdf>.
- Leydesdorff, L. (2002). Indicators of structural change in the dynamics of science: Entropy statistics of the sc journal citation reports. *Scientometrics*, 53(1), 131–159.
- Leydesdorff, L. (2004). Top-down decomposition of the journal citation report of the social science citation index: Graph- and factor-analytical approaches. *Scientometrics*, 60(2), 159–180.

- Leydesdorff, L. (2008). The delineation of nanoscience and nanotechnology in terms of journals and patents: A most recent update. *Scientometrics*, 76(1), 159–167.
- Leydesdorff, L., & Cozzens, S. E. (1993). The delineation of specialties in terms of journals using the dynamic journal set of the science citation index. *Scientometrics*, 26, 133–154.
- Leydesdorff, L., & Zhou, P. (2007). Nanotechnology as a field of science: Its delineation in terms of journals and patents. *Scientometrics*, 70(3), 693–713.
- Lievrouw, L. A. (1989). The invisible college reconsidered: Bibliometrics and the development of scientific communication theory. *Communication Research*, 16, 615–628.
- Locke, J., & Perera, H. (2001). The intellectual structure of international accounting in the early 1990s. *International Journal of Accounting*, 36(2), 223–249.
- Low, M. B., & MacMillan, I. C. (1988). Entrepreneurship: Past research and future challenges. *Journal of Management*, 14(2), 139–161.
- Meyer, G. D. (2011). The reinvention of academic entrepreneurship. *Journal of Small Business Management*, 49(1), 1–8.
- Price, D. J. de Solla (1963). *Little science, big science*. New York: Columbia University Press.
- Price, D. J. de Solla (1971). Some remarks on elitism in information and the invisible college phenomenon in science. *Journal of the American Society for Information Science*, 22, 74–75.
- Price, D. J. de Solla (1986). *Little science, big science and beyond*. New York: Columbia University Press.
- Ratnatunga, J., & Romano, C. (1997). A citation classics' analysis of articles in contemporary small enterprise research. *Journal of Business Venturing*, 12(3), 197–212.
- Ravallion, M., & Wagstaff, A. (2011). On measuring scholarly influence by citations. *Scientometrics*, online first. doi:10.1007/s11192-011-0375-0.
- Reader, D., & Watkins, D. (2006). The social and collaborative nature of entrepreneurship scholarship: A co-citation and perceptual analysis. *Entrepreneurship Theory and Practice*, 30(3), 417–441.
- Rigney, D., & Barnes, D. (1980). Patterns of interdisciplinary citation in the social sciences. *Social Science Quarterly*, 61(1), 114–127.
- Romano, C., & Ratnatunga, J. (1996). A citation analysis of the impact of journals on contemporary small enterprise research. *Entrepreneurship: Theory and Practice*, 20(3), 7–21.
- Sarasvathy, S. D., & Venkataraman, S. (2011). Entrepreneurship as method: Open questions for an entrepreneurial future. *Entrepreneurship Theory and Practice*, 35(1), 113–135.
- Schildt, H. A., Zahra, S. A., & Sillanpää, A. (2006). Scholarly communities in entrepreneurship research: A co-citation analysis. *Entrepreneurship Theory and Practice*, 30(3), 399–415.
- Shane, S., & Venkataraman, S. (2000). The promise of entrepreneurship as a field of research. *Academy of Management Review*, 25, 217–226.
- Silva, E. G., & Teixeira, A. A. C. (2008). Surveying structural change: Seminal contributions and a bibliometric account. *Structural Change and Economic Dynamics*, 19(4), 273–362.
- Steyaert, C., Hjorth, D., & Gartner, W. B. (2011). Six memos for a curious and imaginative future scholarship in entrepreneurship studies'. *Entrepreneurship & Regional Development*, 23(1), 1–7.
- Taylor, R. S. (1986). *Value-added processes in information systems*. Norwood, NJ: Ablex.
- Tuire, P., & Erno, P. (2001). Exploring invisible scientific communities: Studying networking relations within an educational research community: A Finnish case. *Higher Education*, 42, 493–513.
- van den Besselaar, P., & Leydesdorff, L. (1996). Mapping change in scientific specialties: A scientometric reconstruction of the development of Artificial Intelligence. *Journal of the American Society for Information Science*, 47(6), 415–436.
- Venkataraman, S. (1997). The distinctive domain of entrepreneurship research. In J. A. Katz (Ed.), *Advances in entrepreneurship, firm emergence and growth* (Vol. 3, pp. 119–138). Oxford, UK: Elsevier/JAI Press.
- Vieira, P. C., & Teixeira, A. A. C. (2010). Are finance, management, and marketing autonomous fields of scientific research? An analysis based on journal citations. *Scientometrics*, 85(3), 627–646.
- Wallace, D. P. (2007). *Knowledge management: Historical and cross-disciplinary themes*. Westport, CT: Libraries Unlimited.
- Waller, J. H. (2006). Evaluating scholarly communication at the subdisciplinary level. *Collection Management*, 30(2), 45–57.
- Watkins, D., & Reader, D. (2004). Identifying current trends in entrepreneurship research: A new approach. Accessed April 2011, from http://www.kmu.unisg.ch/rencontres/RENC2004/Topics/Watkins_Renc_2004_Topic_A.pdf.
- Werner, S., & Brouters, L. E. (2002). How international is management? *Journal of International Business Studies*, 33(3), 583–591.
- Wiklund, J., Davidsson, P., Audretsch, D., & Karlsson, C. (2011). The future of entrepreneurship research. *Entrepreneurship Theory and Practice*, 35(1), 1–9.

- Zahra, S. (2007). Contextualizing theory building in entrepreneurship research. *Journal of Business Venturing*, 22(3), 443–452.
- Zitt, M. (2006). Scientometric indicators: A few challenges. Data mine-clearing, knowledge flows measurements, diversity issues, invited plenary talk. In *Proceedings international workshop on webometrics, informetrics and scientometrics & seventh COLLNET meeting*, Nancy (France). <http://eprints.rclis.org/archive/00006306/>.
- Zuccala, A. (2006). Modeling the invisible college. *Journal of the American Society for information Science and Technology*, 57(2), 152–168.
- Zuccala, A., & van den Besselaar, P. (2009). Mapping review networks: Exploring research community roles and contributions. *Scientometrics*, 81(1), 111–122.