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An empirical investigation of the influence of collaboration in Finance on article impact

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Abstract

We investigate the impact of collaborative research in academic Finance literature to find out *whether* and *to what extent* collaboration leads to higher impact articles (6667 articles across 2001-2007 extracted from the Web of Science). Using the top 5% as ranked by the four-year citation counts following publication, we also follow related secondary research questions such as the relationships between article impact and author impact; collaboration and average author impact of an article; and, the nature of geographic collaboration. Key findings indicate: collaboration does lead to articles of higher impact but there is *no significant marginal value for collaboration beyond three authors*; high impact articles are not monopolized by high impact authors; collaboration and the average author impact of high-impact articles are positively associated, where collaborative articles have a higher mean author impact in comparison to single-author articles; and *collaboration among the authors of high impact articles is mostly cross-institutional*.

Keywords: Collaboration; Citation analysis; Article impact; Author impact; Finance

***MSC* classification:** 65-00

***JEL* classification:** G00; G30

Introduction

According to Vieira and Teixeira (2010, p.636), "…Finance is an autonomous, organized and settled field of research". The main purpose of this article is to empirically investigate the influence of collaboration on article impact in academic Finance literature. Collaborative research is defined as research articles written by two or more people and intrinsically assumes sharing of ideas, skills and resources. Article impact is measured by various citation counts we develop.

An earlier study by Avkiran (1997) with a similar research question arrived at the conclusion that collaboration in Finance does *not* lead to better quality research, where quality was measured by the citation rate over a four-year period following publication. Avkiran's study was limited to a sub-sample of 540 articles from fourteen Finance journals across 1987-1991. In the current study, we are interested in expanding the analysis to a much larger sample, namely, 6667 articles from Web of Science (WoS) and 5818 articles from Scopus, across twenty-three journals covering the period 2001-2007. Although our starting point for selecting journals is different to that of Avkiran (1997), ten of his journals are also on our list.

The statement in Avkiran (1997, p.173), "The tendency for collaborative research will probably continue as research content and methodology become more sophisticated, and academic survival becomes more dependent on publishing" is equally valid today. For example, only 26.77% of the WoS sample is comprised of single-author articles, as opposed to the much higher 49.80% reported in Avkiran (1997). Thus, *the principal motivation for this article is to examine whether collaboration is leading to articles of higher impact, and if*

so, to what extent. We also investigate related secondary research questions such as the relationships between higher impact articles and higher ranked journals; article impact and author impact; collaboration and average author impact of an article; and, the nature of geographic collaboration. Findings can guide decision-making in such matters as individuals considering entering collaborative research; recruitment decisions; promotions; determination of academic salaries; mentoring; writing research grant applications; designing research workshops; editorial strategies; and, management of academic visits.

Wuchty et al. (2007), who define a 'team' as having more than one listed author on a publication, study 19.9 million research articles extracted from the Web of Science covering five decades of science and engineering, social sciences, and arts and humanities. Focusing on the field of social sciences that Finance belongs, Wuchty et al. report that in 1955 only 17.5% of articles were written by teams – a number that climbed to 51.5% by 2000. While the current average team is acknowledged as comprised of two people, the trend is said to be towards larger teams. According to Wuchty et al. (2007, p.1037), "In the social sciences, psychology, economics, and political science show enormous shifts toward teamwork, sometimes doubling or tripling the propensity for teamwork".

The next section outlines the *conceptual framework* in more detail, followed by a section on *data and method*. Empirical test results are reported under *findings*, and the article ends with *concluding remarks* that also discuss limitations and possible extensions.

Conceptual Framework

Advantages and Disadvantages of Collaboration

In this section we expand on our comments in the introduction to include a brief discussion of the advantages and disadvantages of collaborative research. Some of the more obvious advantages of collaborative research can be time saved as a result of shared workload; generation of a greater variety of ideas on how to address a research question; enhanced motivation and satisfaction resulting from working in a social environment created by a team; and hopefully, better odds of publishing the resulting manuscript. Beaver (2001) outlines the salient advantages of a typical research team at a major university as efficiency, speed, breadth, synergy, reduced risk, flexibility, accuracy, and feedback and visibility. Expanding on the less obvious advantages listed by Beaver, 'reduced risk' refers to enabling simultaneous execution of multiple projects, thus raising the odds of success. 'Flexibility' refers to having one speculative project among several where failure is unlikely to destroy a team but success is likely to open new directions and lead to new funding. On the other hand, 'feedback and visibility' refer to team members making multiple presentations of their work-in-progress, and in the process, marking their territory.

There may be some disadvantages as well with collaborative research. One that immediately springs to mind is about individuals' motives that may be misaligned to begin with, or changes that may occur as an article takes shape. In practice, collaboration and the required co-ordination is rarely a smooth process. If a collaborative article that eventually attracts more citations (than a single-author article) initially takes considerably more time to publish, then some of the synergies of teamwork are lost. Other potential problems of

collaboration are: inability to observe the agreed timeframe when personal commitments clash with that of a project; language and cultural barriers when collaboration is at an international level; and, further communication difficulties when authors have different disciplinary backgrounds. According to Gitlin et al. (1994, p.32), "Collaborative relationships necessitate flexibility in thinking and a willingness to have one's ideas expanded on and transformed. This may represent too high a cost to some individuals". In their cognitive study of research collaboration, Chen et al. (1992) state that there is a need for an environment that accommodates differences among group members if research collaboration is to be useful. Similarly, Fox and Faver (1984) conclude that collaboration can potentially restrict creativity. Despite these potential pitfalls, collaborative publications in Finance dominate single-author articles, even though it would be difficult to classify Finance in the same category as Big Science disciplines such as Physics.

A further potential difficulty with collaboration is the inability to simply prescribe it to those who may not be keen to fully participate. Sonnenwald (2007) outlines four different stages of scientific collaboration, namely, foundation, formulation, sustainment and conclusion. Collaboration could fail at any one of these stages with no significant contribution to knowledge. Under the foundation stage, 'scientific', 'political', 'socio-economic', and 'social networks and personal' are listed as the groups of factors influencing the initial establishment of collaboration. For example, scientific factors focus on the desire to pursue avenues that would lead to creation of knowledge and solve problems that may be beyond the resources of a single scientist. Yet, such an environment could also be conducive

to hiding unethical conduct or can give rise to a situation where no one person takes responsibility.

Citation Count as a Measure of Impact

The question of whether collaborative research leads to higher impact research articles has been addressed across a number of disciplines. An investigation of the relationship between number of authors and number of citations in astronomical journals reveals a positive correlation (Abt 1984). Abt also investigated the question of whether more active research fields can distort the observed relationship between citation rates and number of authors, concluding that there is no such distortion. Beaver (1986) points out that collaborative research in Physics is more likely to be of higher impact than single-author research. In general, one may expect collaborative research to yield a higher impact publication due to the collective effort that includes road-testing the findings prior to submission to a journal.

In the current study, impact of a research article is captured by various measures that rely on the number of times an article is cited, explained in more detail in the next section on data collection. Thus, we inherently assume that citations are proportional to the extent an article makes a significant contribution to literature. According to Furnham (1990), citation count is a robust and comparable method of assessing academic quality and performance. Citation rates have also been shown to be associated with other indicators of quality such as number of scientific awards received and choices of expert panels (Cole and Cole 1973; Lawani 1977; Lawani and Bayer 1983).

However, the number of citations as a measure of quality or impact has two key potential problems, namely, *self-citations*, and *negative citations* where others point out shortcomings of a study. Both cases could artificially inflate citation counts. In this study, we were unable to comprehensively address either potential problem in citation counts due to the large number of articles in our sample and differences in the functionality of the two major data bases used. However, we do examine self-citations in some depth when we describe data in the next section. We also emphasize that such potential distortions can sometimes be over-analyzed. For example, a negative citation can also be a contribution to literature. In the words of Cole and Cole (1973, p.25), "It is unlikely…that work which is valueless will be deemed significant enough to merit extensive criticism". A negative citation has an intrinsic value as well - in that it can act as a warning about the discredited theories or findings for the benefit of early career researchers. Similarly, some self-citations would be a natural outcome of an author with an established track record extending his or her existing studies that will have to be duly cited (Katz and Hicks 1997).

Data and Method

Description of Data

The seven-year study period of 2001-2007 captures articles published from the early 21st Century. The study period allows a maximum of a four-year *consistent citation collection period* for all the articles (ignoring the incomplete year of 2012 when this article was written). We use two well-known citation data bases to collect data, namely, Web of Science by Thomson Reuters, and Scopus by Elsevier. WoS, which is the older of the two data bases, is our preferred source due to its more flexible, streamlined and reliable export facilities. For

example, based on our experience with Scopus and large files, it is not possible to quickly export a breakdown of yearly citations for 2001 onwards, unless the citation tracker is used. However, this facility can only email the user a URL after a couple of days following the request (with no identification of the original search terms). More importantly, reports delivered by Scopus do not always match what was requested or was visible on the original search screen. Furthermore, algorithms behind Scopus occasionally fail to identify a particular year's data in a range of years, even though the missing year's data can be found separately. On the other hand, the WoS citation reports can be generated almost instantly, reliably, and with all the data needed in one place.

Selection of journals to include in data collection follows the study by Currie and Pandher (2011, see Table 5 on p.18). By working with a pre-selected list of ranked Finance journal titles from a recent publication, we avoid introducing arguments into the selection process that have not been exposed to peer review. Initially, we focus on tier *B*- and above - twenty-nine titles in total. *B*- cut-off can be justified because our research question is focused on article impact – a phenomenon more likely to be observed among higher ranked journals – and on the grounds of making downloads and data processing manageable.[1] *H-indices* reported by WoS (*A*+, 109; *A*-, 49; *B*+, 38; *B*, 37; and *B*-, 22) show the progressive nature of this index from *B*- to *A*+, thus adding confidence to the tiers generated by Currie and Pandher (2011). That is, as we move up the tiers, we notice a larger number of articles that are more heavily cited. For example, an *h-index* of 109 means there are 109 articles cited 109 times or

[1] In some disciplines such as clinical medicine, there may not be significant differences between citation counts on articles published in journals of high, moderate and low impact factors (Falagas et al. 2010).

more (Hirsch 2005). The only two tiers that are close to each other on the *h-index* are *B+* and *B.*

Table 1 lists the journals considered for data collection ranked in a descending order as originally reported by Currie and Pandher (2011). The ranking is based on the so-called Active Scholar Assessment methodology (i.e., survey of active scholars) and nested regression that produces tiers and a numerical estimate of quality (the latter determines rank ordering). We drop six titles due to either a journal not being listed consistently throughout the study period of 2001-2007 or not being listed at all, thus working with a *final list of twenty-three journals*. The only difference in the composition of this list for the Scopus download is that the Journal of Empirical Finance and Journal of International Financial Markets Institutions & Money are included, while the Journal of Derivatives and European Financial Management are omitted (see Table 1 for explanations).

[Insert Table 1 about here]

Seven journals spanning all the tiers except *B-* account for 53.31% of the articles in the seven-year sample. In descending order, these are: Journal of Banking and Finance, Journal of Finance, Journal of Financial Economics, Journal of Money Credit and Banking, Journal of International Money and Finance, Journal of Portfolio Management, and Journal of Futures Markets. We also notice a steady rise in the yearly number of articles published - from 10.24% in 2001 to 18.43% in 2007 of the total sample of 6667 articles in WoS across twenty-three journals. A breakdown of the origin of articles indicates that the majority are from the USA (65.14%), followed by UK (10.12%) and Canada (5.63%), where the rest are shared among sixty-seven other countries.

Hypotheses

As part of the exercise to determine discrete categories of collaboration for empirical testing, we profile the sample of Finance articles in WoS (see the first two columns in Table 2). The great majority fall into categories with one to four authors, where five or more authors are lumped into a final category, resulting in a total of five categories or types of article. The largest category is the type 2 articles at 43.39% followed by 26.77% of the sample comprised of type 1 articles. When examined on a yearly basis, this relationship is stable from 2001 to 2005 but type 3 articles take the position of the second largest group in 2006 and 2007 (yearly proportions are available from the author). There are then four hypotheses to statistically test along the lines of,

> H1 = There is no significant difference between the distribution of citations for two-author (type 2) and single-author (type 1) articles; and
>
> H2 = There is no significant difference between the distribution of citations for three-author (type 3) and single-author (type 1) articles, etc.

[Insert Table 2 about here]

To enable hypothesis testing, we also generate some additional data per article based on citation reports extracted from WoS, such as total citations, number of authors, age of an article, annual mean citations, four-year and five-year citation counts following publication, and number of pages. More specifically, each article's total citations can be divided by the number of years following its year of publication up to and including the cut-off year of 2011 (i.e., age) to arrive at an annual mean – reported in Table 2 (e.g., the number of total citations

for an article dated 2001 is divided by 10 - ignoring 2012 which is the year of writing this article). Levitt and Thelwall (2010) underscore the importance of using multiple indicators in their cross-country study of higher citation of collaborative Economics articles published in 2000; while the authors report that results can vary considerably between indicators, they also admit that the word 'considerably' is subjective, i.e. no tests of statistical difference are reported.

Self-citations

We now briefly discuss *aggregate self-citations* in WoS for the five tiers of interest in this study. The proportions of self-citations are as follows: *A*+ (25.57%), *A*- (24.91%), *B*+ (17.33%), *B* (24.33%) and *B*- (19.32%). The only noticeable trend in these numbers is that self-citations are most prevalent in the top two tiers. Otherwise, the range 17.33-25.57% is not large in a citation analysis that concentrates on a single discipline. We also take advantage of *article-level citation counts* provided by Scopus where self-citations can be omitted and generate further aggregate statistics. While, once again, we notice a problem with Scopus' algorithm where in a small number of cases citation count without self-citations is reported as greater than the regular count, we were able to identify and omit such cases. Table 3 reports the annual mean proportions of self-citations observed in each of the five tiers, as well as the overall figures.

[Insert Table 3 about here]

Overall mean proportion of self-citations in Scopus range between 6.32-21.57%, showing a general upward trend as we descend the five tiers, although we are unable to place

confidence in figures for the *B*- tier because they are based on only one journal and the 2004 data are missing. The most noticeable change in the overall mean proportion of self-citations is between *A*+ and *A*- tiers. That is, this observation is contrary to that of WoS self-citations reported earlier, both in range and where the largest self-citations are found. This difference between the self-citations identified from the two data bases leads us to believe that comparable algorithms are yet to be developed. The small rise across time shows no clear trend. We proceed to the core analysis without further consideration of self-citations and using only the WoS data base.

Findings

The Core Analysis

The null hypothesis states that *citations come from the same distribution*. For example, if the null hypothesis is statistically rejected where the annual mean citations for collaborative articles is higher (as can be seen in Table 2), then the implied conclusion is that collaborative research in Finance *does lead* to higher impact articles. Because citations are skewed, we use the Mann-Whitney U test. Independent samples Mann-Whitney U test in SPPS *rejects all but the fourth null hypothesis* at the .000 level of significance (i.e., distributions are significantly different).[2] Comparison of annual mean citations for type 1 and type 5 articles retains the null at a level of .470.

[2] The sub-samples of different types of article are independent because given that citations are based on an article and not directly attributed to authors *per se*, the probability of observing a particular citation count, say, for a single-author article, is independent of the probability of observing the citation count for an article with two-authors where one of the authors is the same person as that of the single-author article. In other words, we maintain that we cannot predict the citation count for one type of article based on our knowledge of the citation count for another type of article.

It could be argued that the annual mean citations for a much younger or a much older article may be lower because for most articles it takes a few years for citations to build up, and after four or five years citations usually start tapering off. To address this concern, the total number of citations for a given article can be identified, say, over a fixed period of four or five years following its year of publication in order to standardize the citation collection period (see Avkiran 1997 and Borokhovich et al. 2000). [3]

Once again, Mann-Whitney U test *rejects all but the fourth null hypothesis* at the .000 level of significance. A comparison of type 1 and type 5 articles retains the null at a level of .555 with the four-year citation count, and at a level of .206 with the five-year citation count (the latter excludes 2007 publications because of the 2011 cut-off for citation counts). Here, we extend the Mann-Whitney U tests to probe the *marginal value of collaboration* based on the four-year citation counts. That is, given the potential coordination difficulties as more authors come on board, is there a marginal gain in terms of increased citation probability in moving from a type 2 to a type 3, or from a type 3 to a type 4 article? With the type 2/3 comparison, the null hypothesis is rejected at a level of .000, suggesting that a third author may indeed contribute to publishing a higher impact article. However, with the type 3/4 comparison, the null is retained at a level of .127, suggesting that involving a fourth author is unlikely to have a significant marginal value.

We further test the difference between single-author and collaborative articles by setting up a Tobit regression similar to the approach in Borokhovich et al. (2000); a Tobit model is appropriate when there is a cluster of zeros in the observed data set (i.e., about

[3] Annual mean citation counts for each of the seven publication years in the study indicate a steady rise over the four years following publication (numbers are available from the authors).

15.43% of the WoS sample has four-year citation counts equal to zero). Table 4 shows the results where the Tobit model is censored at zero and the model parameters are estimated using maximum likelihood in SAS. A classification variable equals 0 or 1 depending on the absence or presence of a type of article, where type 1 articles (i.e., single-author) comprise the intercept or reference category. Results point to a *statistically significant higher prediction of the four-year citation count* by all types of articles (except type 5) when compared to single-author articles - thus supporting the findings reported earlier using Mann-Whitney U tests. For example, in Table 2 it was reported that the highest mean four-year citation count belongs to type 4 articles. Similarly, Table 4 indicates that the highest predicted value of this citation count (5.28) is found with type 4 articles.

[Insert Table 4 about here]

We also notice that the number of pages is positively correlated with citations significant at the 1% level, similar to what was originally reported in Avkiran (1997). The corresponding Pearson's *r* correlations are: annual mean citations per article (.370); four-year citation count (.384); and five-year citation count (.386). Although the magnitudes of these statistically significant correlations are not high, they suggest that longer articles attract more citations. This is an intuitive finding because a longer article, all else the same, would present more material that could potentially be cited, say, compared to shorter articles that are likely to be more specialized in scope. Nevertheless, Mann-Whitney U tests return the same results when we control for the number of pages in the four-year citation count, thus implying no significant change to the evaluation of the effect of collaboration on article impact. Finally, a comparison of the full WoS sample ranked on the four-year citation count against

corresponding journal rankings reveals Spearman's (0.485) and Kendall's tau-b (0.354) rank correlations statistically significant at a level of .000.

Further Analysis Based on the Top 5% of the Web of Science Sample

In order to operationalize a set of secondary questions around the main research question of the role of collaboration in publishing high impact articles, we now focus on the top 5% (N=305) as ranked by four-year citations appearing across 2001-2007 in the WoS sample. All seven years are represented in this sub-sample, with a greater presence of articles published in the period 2005-2007. Profiling this sub-sample on types of articles reveals a distribution similar to that of the full sample where, once again, articles with two authors are in the greater majority (44.26%) but the second largest group is represented by articles with three authors (30.16%), as opposed to single-author articles observed in Table 2 (i.e., overall there is more collaboration). A breakdown of the number of types of articles in the sub-sample reveals type 1 (57), type 2 (135), type 3 (92), type 4 (18), and type 5 (3). We note that the following six journals ranked 13 or lower are not represented in the top 5% (corresponding ranks are in brackets): Financial Analysts Journal (13), Journal of Futures Markets (16), Journal of Portfolio Management (17), Journal of Derivatives (20), Journal of Real Estate Finance and Economics (21), and European Financial Management (23).

As a follow-on from the positive association found in the full WoS sample, the first secondary research question we pose is *whether higher impact articles are appearing in higher ranked journals* as would be expected. A comparison of journal rankings (as per Table 1) finds that the median journal rank is 2 corresponding to the top 5% sub-sample, and 9 for the remainder of the sample; and the modal journal rank is 1 corresponding to the top 5%

sub-sample, and 6 for the remainder. Furthermore, 249 of the 305 articles in the top 5% sub-sample appear in the top three ranked journals, namely, Journal of Finance (119), Review of Financial Studies (34) and the Journal of Financial Economics (96). These findings support the anticipated link between higher impact articles and higher journal rankings.

Association between Article Impact and Author Impact

We continue to extend our investigation by examining the *association between article impact and author impact*. Author impact, measured by the *h-index* manually extracted for each author using Harzing's Publish or Perish freeware excludes a person's publications following the year of publication of an article under investigation (e.g., while examining the impact of an author in an article published in 2007, we exclude publications that appear after 2007 in arriving at the author's *h-index*). According to Hirsch (2005, p.16569), "…two individuals with similar *h*s are comparable in terms of their overall scientific impact, even if their total number of papers or their total number of citations is very different." Once again, we work with the four-year citation count as the measure of article impact. In this approach, we are essentially pitching article impact against author impact at the time of an article's publication. The bivariate correlation between article impact and average author impact for each article (i.e., mean of *h-indices* of co-authors) is *insignificant* at 0.0584; using the median of indices instead also results in an insignificant correlation of 0.0448.

A question related to the above is whether the *mean h-indices of collaborative articles* are statistically different to that of articles with one author. Mean *h-indices* across article types are: type 1 (4.93), type 2 (7.72), type 3 (7.54), type 4 (8.26) and type 5 (6.17). Mann-Whitney U test *rejects all three null hypotheses* between .000 - .002 levels of significance

(i.e., distributions are statistically different when we compare type 1 articles to collaborative articles).[4] Thus, we can conclude that collaboration and the average author impact of an article are positively associated.

Geography of Collaboration

We also profile Finance articles on institutional affiliation in order to examine *geographic collaboration*. That is, to what extent are co-authors from the same institution (local collaboration), across institutions in the same country (national collaboration), or institutions from more than one country (international collaboration)? Such an inquiry can also provide a mapping of collaborative activity *across countries and continents* to help investigate if there have been significant shifts over time, say, from the USA and Europe to Asia among the high impact articles. Analysis reveals the majority of the articles to be the result of national collaboration (142), followed by local (104), and international (59); these numbers suggest a substantial degree of *cross-institutional collaboration* among authors. Examination of country affiliation of authors (ten or more cases) in the top 5% sub-sample indicates USA far ahead of other countries – similar to the pattern reported earlier for the full WoS sample: USA (561), UK (34), Canada (16), France (12), China (11) and Switzerland (10). This pattern is also visible in the break-down by continents. Figure 1 shows the continental affiliation of authors across 2001-2007 where North America and Europe change in opposite directions,[5] Asia experiences mostly a gentle but steady rise, and representation of Oceania remains stable over the study period (proportions add up to 100% in each year). Although not

[4] A comparison between type 1 and type 5 articles was not attempted because there are only three observations in the latter type in the sub-sample of top 5%.
[5] Given that Europe comprises the second largest continental affiliation, mathematically we would expect to see its corresponding annual proportions move in the opposite direction to that of North America.

explored in the current study, an examination of articles published in 1995/96 across eight major fields of science by Glänzel (2001, p.69) reports that "…international co-authorship, on average, results in publications with higher citation rates than purely domestic papers."

[Insert Figure 1 about here]

Concluding Remarks

We set out to establish *whether* and *to what extent* collaboration in Finance research in the 21st Century has been producing articles of higher impact. Our primary investigation based on the full Web of Science sample reveals that collaboration does indeed lead to articles of higher impact as measured by greater citation counts, and that impact steadily rises as we move from two authors to three and then four authors per article. However, analysis of the marginal value of collaboration indicates some limitations to the benefits of collaboration in terms of article impact. For example, while a third author may contribute to publishing a higher impact article, involving a fourth author is unlikely to have a marginal value. Descriptive statistics reveal type 2 articles comprising the majority - suggesting that collaboration with a second author may well be considered the most pragmatic approach, although there is some trade-off of article impact when a third author is not involved. We also discover a positive association between article length and impact. However, when we control for article length in the four-year citation count, we find no difference in results on hypothesis testing.

Highlights of other key findings based on the sub-sample of top 5% are listed below, although we are unable to confidently extrapolate every finding to the full WoS sample:

- Higher impact articles appear in higher ranked journals (also observed with the full sample);
- The association between article impact and author impact is *insignificant* in the sub-sample, which suggests that high impact articles are not monopolized by high impact authors;
- Collaboration and the average author impact of a high-impact article are positively associated, where we notice collaborative articles have a higher mean author impact in comparison to type 1 articles. This observation suggests that successful authors maximize their efforts by effectively collaborating with others; and
- Regarding geographical collaboration,
    - There is evidence of a substantial degree of cross-institutional collaboration among authors of high impact articles;[6]
    - Country affiliation of authors shows the USA to be well ahead of all other countries; and
    - Continental affiliation of authors indicates that the changes in output from North America and Europe are in opposite directions, whereas Asia (represented mainly by China) displays a gentle but steady rise across the study period 2001-2007.

We re-iterate that the findings can be used both at the individual level or group level for various purposes including recruitment, promotions, academic salaries, mentoring, grant

[6] Bordons et al. (1996) report on the relationship between types of collaboration in Biomedicine research emanating from Spain and expected impact factors. Expected impact factors under international collaboration are significantly higher compared to domestic or local collaborations. Bordons et al. also report that international collaboration leads to higher visibility for Spanish scientists because they publish in higher impact journals.

applications, workshops, editorial strategies, and management of academic visits. For example, the above highlights of findings may lead us to encourage others to target higher ranked journals regardless of one's track record, and network with authors from other institutions because collaboration can be rewarding for one's career. Similarly, all else the same, we may hesitate to invite a fourth person to join a team because of the dubious association with increased citation probability. On the other hand, the cross-institutional nature of collaboration among the authors of the top 5% suggests that resources put to hosting carefully selected researchers can be rewarding for the participants and the organizations they belong. A study by Katz and Hicks (1997) of UK articles across multiple disciplines and sectors finds collaborative articles having greater impact than non-collaborative articles, where the highest impact involves a foreign institution. Katz and Hicks (1997) also scrutinize their data to quantify the effect of adding an author. Their results suggest that adding *one more author* from the same institution or another domestic institution brings about 0.75 additional citations, whereas an author from a foreign institution adds 1.6 citations; corresponding additional citations for adding *two more authors* are 1.6 and 3.2, respectively.

Limitations

We would also like to mention a limitation that has recently been formally acknowledged. Citation based studies can suffer from a bias created by editors who insist on authors citing articles from their journals at the point of accepting a submission (a.k.a. coercive citations). Wilhite and Fong (2012) have documented this practice in their recent study across 6672 survey responses and data from 832 journals across multiple disciplines including Economics and Business. Some of their conclusions of specific interest to this article are (a) coercion is

more prevalent in business disciplines, and (b) highly ranked journals are more likely to coerce (Wilhite and Fong 2012, p.543). For example, survey data reveal that publishing in the discipline of Finance adds 18.6% to the chance of being coerced (in relation to Economics); similarly, analysis of Finance journal data reveals that the probability of coercion stands at 37.7%. In an equally telling manner, in their supporting online material (see Table S12), the authors list the journals identified as coercers by survey respondents. This long list of 177 journal titles includes eleven of the Finance titles followed in this article. Wilhite and Fong's study has been acknowledged in a joint policy statement regarding coercive citations by the editors of Journal of Finance, Journal of Financial and Quantitative Analysis, Journal of Financial Economics, Review of Asset Pricing Studies, Review of Corporate Finance Studies, and Review of Financial Studies.[7] All four of the *A+* journals listed in our Table 1 participate in this joint policy statement.

Discussion of Potential Extensions

Since the answer to the principal research question posed in the current study is affirmative, measuring or identifying the *potential for collaboration* would be a natural extension. Giuliani et al. (2010) demonstrate such an attempt in Medical Genetics by focusing on interests researchers have in common but are unaware of. Their approach includes computation of an index based on existing co-authorship and overlap in keywords (i.e., content sharing). Others interested in further analysis of research collaboration in Finance may also consider measuring the *potential for collaboration*. For example, if we were to look outside the Finance discipline, Economics appears as a likely candidate for collaboration

[7] See http://www.afajof.org/journal/policy_citations.asp.

based on a finding by Vieira and Teixeira (2010, p.640) who state that "…Finance scientific field has a very important connection with Economics and a minor one with Accounting…"

Another comment is also warranted in light of the recent policy report released by The Royal Society (2012). Collaboration can be defined in a much broader manner than what has been discussed in the current article. That is, in the presence of today's information technologies, scientific inquiry does not need to be confined to collaboration in writing an article. According to the report, capacity for self-correction is founded on being open to scrutiny and therefore, the data used in a journal article should be *concurrently accessible*. While such openness would facilitate a self-regulating system of integrity and error detection, its adoption is mostly noticeable by its paucity in the discipline of Finance. In our haste to be productive in an environment that constantly reminds us of the competition, "Open data for open science" (as the subtitle of the report declares) is bound to be met with certain cynicism. Nevertheless, the compelling recommendations in the report urge key players such as journal editors and universities to collaborate in fostering an open data culture. The report also notes that current systems of reward in universities are not conducive to widespread adoption of open data. While some editorial policies do encourage authors to upload data used in articles, this practice is neither compulsory nor widespread. Yet, data repositories are no longer difficult or expensive to set up and maintain. Once the individual and institutional reward systems that currently accompany publishing are better aligned with open and intelligible communication of data, the quality of Finance articles will also benefit from the ensuing closer scrutiny expected. We extend an open invitation to readers to consider participating in

this discussion in the context of a wider collaboration in Finance. Such a discussion can lay down the operating rules for *open data Finance research*.

Finally, as a follow-on from the above comments towards a broader definition of collaboration, we draw the reader's attention to potential benefits of operating an *open peer review*. A recent experiment by Leek et al. (2011) pitches *open* against the dominant practice of *closed peer review*. Findings indicate an 11% higher reviewing accuracy rate where referees openly cooperate with authors. Leek et al. (2011) explain their observations by noting that referees are rewarded under an open peer review process and referees and authors are more inclined to cooperate, i.e. overall, more open lines of communication can raise review accuracy. On an intuitive level, one would expect referees to weigh their comments more carefully in an open review environment, and more importantly, be more prepared to respond to authors' rebuttals. Similarly, we could expect authors to be more accepting of the referees' comments if identities are not concealed. In summary, under an open review process, the overall expectation is that both parties would be more inclined to cooperate with each other towards resolving problems, rather than taking on a more adversarial posture driven by secrecy and resulting speculation.

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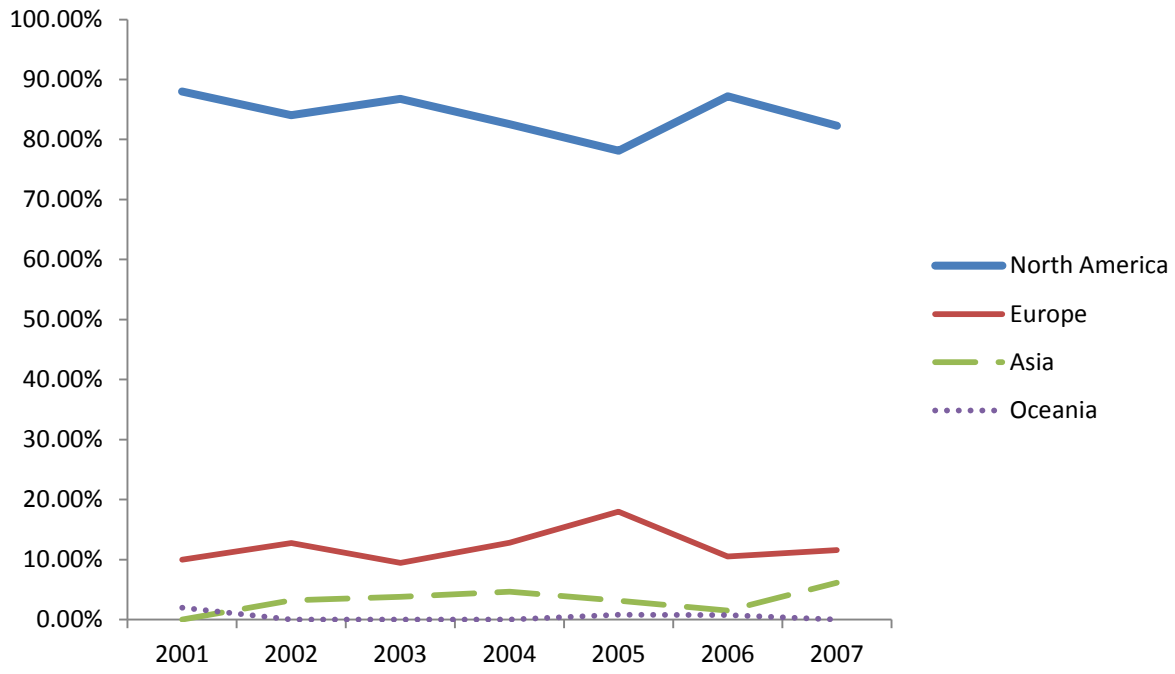

Fig. 1 Continental affiliation of authors across 2001-2007. The figure plots the continental affiliation of authors across the study period in the top 5% (by article impact) of the Web of Science sample.

Table 1: Journals in the study ranked in descending order as per Currie and Pandher (2011)

The journals accessed in the Web of Science are numbered in square brackets. In 2004 the European Finance Review was re-named Review of Finance and only as of 2008 has it been included in Web of Science. Similarly, Scopus lists European Finance Review for 2003 only, and Review of Finance for 2004 onwards.

Journal	*Tier*
[1] Journal of Finance	A+
[2] Review of Financial Studies	A+
[3] Journal of Financial Economics	A+
[4] Journal of Financial and Quantitative Analysis	A+
[5] Journal of Money Credit and Banking	A-
[6] Journal of Banking & Finance	A-
[7] Mathematical Finance	A-
[8] Journal of Financial Intermediation	A-
[9] Journal of Corporate Finance	B+
[10] Financial Management	B+
Journal of Empirical Finance [*Not used* with WoS because it is listed only as of 2008. *Used* with Scopus]	B+
[11] Journal of International Money and Finance	B+
[12] Journal of Financial Markets	B+
[13] Financial Analysts Journal	B
Review of Finance [*Not used* with either data base: See explanation below against European Finance Review.]	B
[14] Journal of Risk and Insurance	B
[15] Quantitative Finance	B
Journal of Financial Research [*Not listed* with WoS and listed with Scopus 2003 onwards. Omit from both data bases.]	B
[16] Journal of Futures Markets	B
[17] Journal of Portfolio Management	B
[18] Journal of Business Finance & Accounting	B
[19] Finance and Stochastics	B
Financial Review [*Not listed* by WoS or Scopus]	B
[20] Journal of Derivatives [Scopus lists 2008 onwards. Omit from Scopus *only*.]	B
Journal of International Financial Markets Institutions & Money [*Not listed* with WoS but listed with Scopus]	B
[21] Journal of Real Estate Finance and Economics	B
[22] National Tax Journal	B-
European Finance Review [*Not used* with either data base]	B-
[23] European Financial Management [Scopus lists 2006 onwards. Omit from Scopus *only*.]	B-

Table 2: Summary of types of articles and corresponding citation counts, WoS (N=6667, 2001-2007)

The annual mean citation count is adjusted for age. The four-year citation count reflects citations over four years following the year of publication. Corresponding median counts are in brackets.

Type of article	Article count	Proportion in sample (%)	Mean citation count	Annual mean citation count	Mean four-year citation count
One author (type 1)	1785	26.77	12.21 (5.00)	1.74 (0.78)	5.43 (3.00)
Two authors (type 2)	2893	**43.39**	16.57 (7.00)	2.40 (1.17)	7.34 (4.00)
Three authors (type 3)	1659	24.88	16.99 (8.00)	2.63 (1.29)	8.34 (4.00)
Four authors (type 4)	292	4.38	**21.14** (9.00)	**3.13** (1.60)	**9.69** (5.00)
Five or more authors (type 5)	38	0.57	16.58 (5.50)	2.50 (1.24)	8.53 (4.00)
Total	6667	100.00			

Table 3: Proportions (%) of self-citations in each tier across time, Scopus

Overall means are reported in brackets underneath the tiers and next to the years. The 2007 mean value without tier *B*- is 14.96%. n/a indicates missing data.

	A+	*A*-	*B*+	*B*	*B*-
	(6.32)	(12.88)	(15.23)	(14.87)	(21.57)
2001 (11.68)	5.61	10.93	15.21	10.67	16.00
2002 (11.05)	4.90	10.60	16.70	8.67	14.39
2003 (13.83)	5.90	13.07	11.04	13.62	25.52
2004 (12.04)	8.14	12.40	12.97	14.64	n/a
2005 (14.03)	5.95	15.35	14.59	14.45	19.81
2006 (15.13)	5.74	13.69	15.43	18.41	22.39
2007 (18.23)	7.52	13.18	18.62	20.50	31.31

Table 4: Tobit regression exploring the relationship between four-year citation counts and types of article, WoS

See Table 2 for more information on different types of articles.

Independent Variables	Parameter estimates and p-values
Intercept (type 1)	3.63 (<.0001)
type 2	2.58 (<.0001)
type 3	3.82 (<.0001)
type 4	5.28 (<.0001)
type 5	3.51 (.0873)
Log likelihood (model fit)	-23,007