

# Patterns of Co-Authorship in Journal Articles in the Social Sciences and Humanities (2000-2010)

Truyken L.B. Ossenblok,<sup>\*</sup> Frederik T. Verleysen<sup>\*</sup> and Tim C. E. Engels<sup>\*\*</sup>

<sup>\*</sup> *Truyken.Ossenblok@ua.ac.be; Frederik.Verleysen@ua.ac.be*

Centre for Research & Development Monitoring (ECOOM), University of Antwerp, Middelheimlaan 1, 2020 Antwerp (Belgium)

<sup>\*\*</sup> *Tim.Engels@ua.ac.be*

Department of Research Affairs and Centre for Research & Development Monitoring (ECOOM), University of Antwerp, Middelheimlaan 1, 2020 Antwerp (Belgium);  
Antwerp Maritime Academy, Noordkasteel-Oost 6, 2030 Antwerp, Belgium

## Abstract

This paper analyses co-authorship in Flemish Social Sciences and Humanities (SSH) from the period 2000-2010, based on a full coverage bibliometric database, the VABB-SHW. Combining whole and fractional calculations on co-authorship occurrence, our findings indicate that both domestic and international collaborative publishing in the SSH is increasing, though considerable differences between disciplines remain. We further demonstrate that multi-authored Flemish SSH articles in journals indexed in the Web of Science (WoS) generally have a higher (international) co-authorship count and growth rate than those in non-WoS journals, indicating the need to include non-WoS data when studying co-authorship in the SSH.

## Introduction

This paper analyses patterns of co-authorship based on a full-coverage set of bibliographic data from an eleven year period (2000-2010) of SSH publications in Flanders. Flanders is the northern Dutch speaking part of Belgium, a country with comparatively strong traditions in scientific and scholarly research collaboration (Larivière, Gingras & Archambault, 2006; Glänzel & Schubert, 2005). Quantifying joint publications -or co-authorships- yields insight into the broader topic of research collaboration. Regardless of some important caveats concerning co-authorship bibliometrics (Katz & Martin, 1997; Laudel, 2002), an important asset of research on co-authorship is its comparability. Basic metrics and their derived measures of collaboration (Egghe, 1991; Liao & Yan, 2012; Rousseau, 2011) are quite easily calculated and compared regardless of the underlying characteristics of the collaborative process. Prior research has demonstrated that scientific collaboration through co-authorship is internationally on the rise, even though important differences between disciplines remain. Equally broadening is the geographical range of such collaborations, albeit not at the same rate in every country under study (Benavent-Pérez, Gorraiz & Gumpenberger, 2012; Newman, 2004; Glänzel & Schubert, 2004; Wagner & Leydesdorff, 2005). For the Social Sciences and Humanities (SSH), which traditionally have been less inclined than the sciences to co-author publications, similar trends have been demonstrated, albeit tentatively (Ardanuy, 2012; Cronin, Shaw & La Barre, 2003; Larivière & *al.*, 2006). However, the validity of these results is uncertain because the major citation databases such as Web of Science (WoS) and Scopus focus on indexing English language articles in international journals at the expense of publications in other languages and of other types (Hicks, 2004; Larivière & Macaluso, 2011; Sivertsen & Larsen, 2012). As a result the observed frequency of co-authorship may be positively biased (Mali, Kronegger, Doreian & Ferligoj, 2012).

The data set used for this paper is the Flemish Academic Bibliographic Database for the Social Sciences and Humanities ('Vlaams Academisch Bibliografisch Bestand voor de Sociale en Humane Wetenschappen' or VABB-SHW). The VABB-SHW was constructed to achieve full bibliographic coverage from the year 2000 onwards of peer reviewed academic publications in Flemish SSH. As such the VABB-SHW supplements publication data obtained from the WoS and is used in the Flemish performance-based university research funding system (PRFS), hence containing both WoS-indexed (the VABB-WoS data subset) and non-WoS-indexed peer reviewed publications (the VABB-GP subset; see, for a full account,(Engels, Ossenblok & Spruyt, 2012)). Particularly relevant for this paper is the fact that the Flemish PRFS, the BOF-key, encourages collaboration through its use of whole counts, i.e. giving each institution full credit for an article which bears its name and address, as opposed to systems that use fractional counts, i.e. counting an article as a single unit and fractionalizing the publication credit (Aksnes, Schneider & Gunnarsson, 2012; Butler, 2010; Ossenblok, Engels & Sivertsen, 2012).

In this paper we investigate how (international) collaborative publishing in Flemish SSH has evolved from 2000 to 2010. In particular we will address four related subtopics: 1° Has the proportion of multi-authored articles changed over time and does it differ between the VABB-WoS and the VABB-GP?, 2° How has the average number of authors per paper evolved?, 3° What is the proportion of internationally co-authored papers?, and 4° What is the contribution of the international co-authors to these papers?

### **Data and methodology**

Our data set consists of 29,348 Flemish peer reviewed journal articles from the period 2000-2010. Although the VABB-SHW database contains books, edited books, chapters and proceedings papers as well, in this paper we present data regarding journal articles as they constitute the bulk of our available bibliographic data, guaranteeing robustness of the results. In addition, journal articles are the only major (i.e. in the SSH) publication type for which we presently dispose of data from the WoS, making it possible to distinguish at the record level between WoS-indexed journal articles (VABB-WoS) and those in non-indexed journals (VABB-GP). This allows for the aforementioned comparison of the two subsets and their possibly divergent patterns of co-authorship.

Another feature of the VABB-SHW data model is the classification of each journal article into one of 16 disciplines and 3 general categories within Flemish SSH, based on departmental author affiliation. Flemish academic authors (i.e. affiliated with one of the five Flemish universities) and international<sup>1</sup> contributors to a publication included in VABB-SHW are distinguishable through the use of unique author codes.

In a first step of data processing the proportion of multi-authored articles within the two subsets (VABB-GP and VABB-WoS) was determined for the Social Sciences and for the Humanities as well as for ten disciplines with a yearly (rounded) output of at least one hundred articles over the eleven year time span. These ten disciplines consist of six Social Sciences (Economics & Business, Educational Sciences, Political Science, Psychology, Social Health Sciences and Sociology) and four Humanities (History, Law, Linguistics and Philosophy). The VABB-SHW

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<sup>1</sup> In our analysis 'international' also denotes authors belonging to research institutions of the French and German communities in Belgium. As a federation, Belgium is the only EU member state where research policies are fully decentralized across the regional governments, enjoying complete autonomy in these matters (Coryn, 2008). As the VABB-SHW was constructed for use in the regional PRFS, at present, data on institutional author affiliation is only collected for the five Flemish universities. Consequently, in our VABB-SHW data Belgian inter-regional collaboration is not visible.

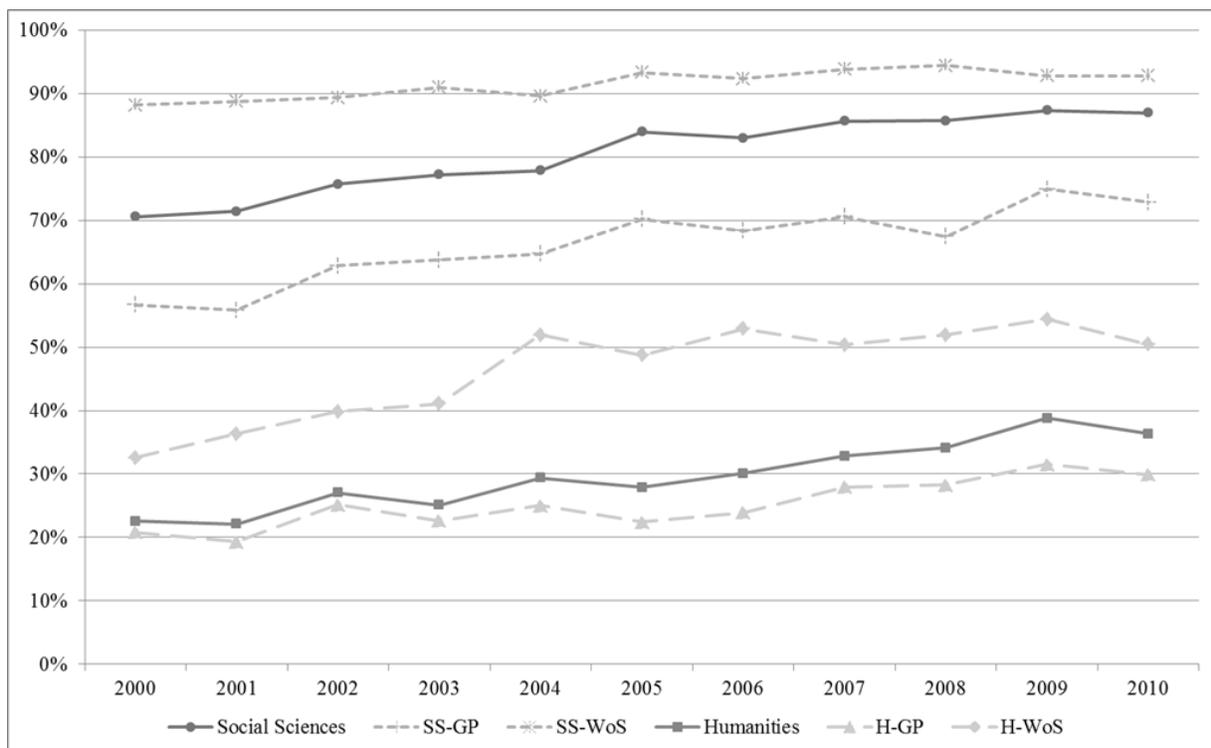
data model attributes an article to a discipline when at least one of its authors has a departmental affiliation to that same discipline. This means that one publication can belong to more than one discipline and to both Social Sciences and Humanities at the same time.

A second step consisted of calculating average author counts per article (Collaboration Index or CI) and the Revised Collaborative Coefficient (RCC). The latter is a measure of collaboration represented by a value between 0 and 1, 0 corresponding to minimum collaboration, i.e. only single-authored papers, and 1 to maximal collaboration, i.e. only multi-authored papers. The RCC takes into account the total number of papers and authors as well as the total number of papers having a certain number of authors. (see for a full account, Liao & Yan, 2012; Egghe, 1991; Rousseau, 2011) In a third step VABB-SHW whole counts were recalculated into fractional counts, as author fractions are indispensable for determining the share of international co-authors in each multi-authored article.

## Results

### *Multi-author articles*

An easily interpretable measure of the degree of collaboration through publications of Flemish SSH researchers is the proportion of articles written by more than one author. For our total data set, this proportion equals 82.1% for the Social Sciences (N= 16042) and 30.2% for the Humanities (N= 12540). This confirms previous research showing that multi-authorship occurrence is considerably higher in the Social Sciences than in the Humanities (Larivière et al., 2006). Figure 1 presents the evolution of this proportion for the Social Sciences and the Humanities, as well as for their respective subsets (GP and WoS).



**Figure 3.** Proportion of multi-author articles in VABB-SHW, by Social Sciences and Humanities (2000-2010).

As shown in Figure 1, between 2000 and 2010, the proportion of co-authored articles has increased for both the Social Sciences (+16.4%) and the Humanities (+13.7%). Thus, although the proportion of multi-authored articles is much larger in the Social Sciences, the growth rates for the Social Sciences and the Humanities are similar. The implication of the increase shown in Figure 1 is a sharp decrease of single authored SSH articles in the period under study: in 2000 about half of all articles were published by one individual, in 2010 this proportion has fallen to roughly one third. Furthermore, Figure 1 indicates a discrepancy between the subsets GP and WoS, showing for both the Social Sciences and the Humanities a larger proportion of co-authored articles for WoS than for GP. However, whereas Humanities-WoS shows a sharper increase (+17.9%) than Humanities-GP (+9.1%), the inverse holds for Social Sciences, where GP increase (+16.1%) exceeds that of WoS (+4.6%). Humanities scholars appear to have stepped up their collaborative efforts regarding publications in WoS-journals in particular, while social scientists have done the same for GP approved journals, as their WoS-articles were already to a large extent the product of collaboration. The average evolution for the Humanities is close to that of its GP subset, as the latter is more substantial in size than its WoS counterpart.

Figure 2 shows the co-authorship proportion within both our data subsets, the VABB-GP and the VABB-WoS, for the Social Sciences and for the Humanities as a whole and for the 10 selected disciplines.

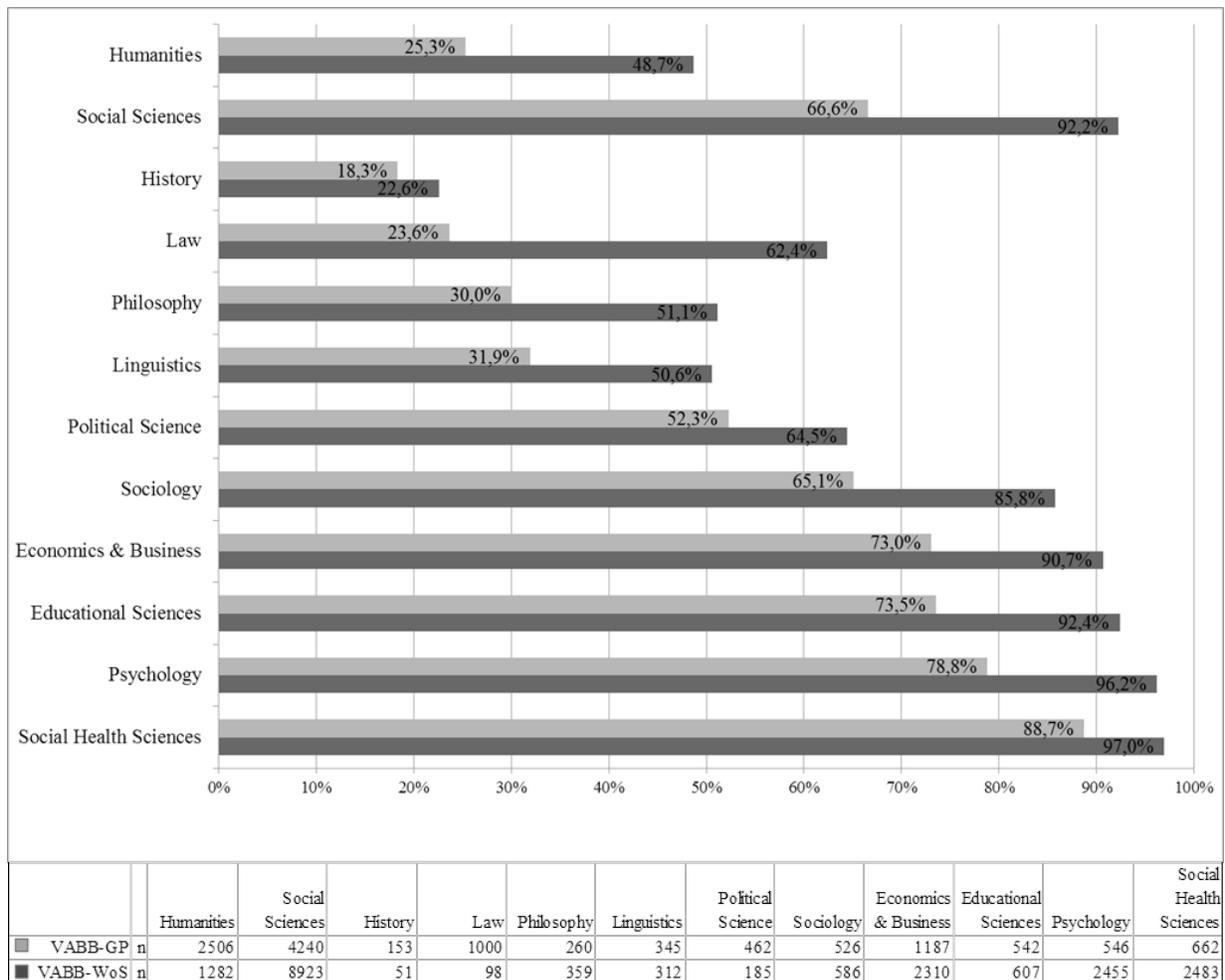


Figure 4. Proportion of multi-author articles included in VABB-WoS and VABB-GP, by discipline.

It is clear that articles in WoS-covered journals are more likely to have multiple authors than articles included in VABB-GP. For the whole of Social Sciences, 92.2% of WoS-indexed (n=8923) and 66.6% of GP-approved articles (n=4240) are written in co-authorship. For Humanities these proportions are respectively 48.7% (n=1282) and 25.3% (n=2506). Differences between VABB-WoS and VABB-GP for the various disciplines are considerable as well: they are smallest for History, Social Health Sciences and Political Science, and largest for Law, Philosophy, and Sociology. Possible explanations of GP-WoS differences are manifold, ranging from the specificity of the various research fields (e.g. law counting a smaller number of WoS-indexed journals, publishing mainly on international or comparative law) to the journal landscape for fields and disciplines (journals possibly favouring collaborative or comparative research outputs transcending national or local topics), to the publication strategies of SSH researchers. Further research could delve deeper into this complex matter. For now, it has sufficiently been demonstrated that the study of co-authorship in the SSH requires additional data to supplement counts based on the WoS, at least in the case of Flanders.

#### *Number of authors per article*

An analysis of the average number of authors per journal article (Collaboration Index, CI) and of the Revised Collaborative Coefficient (RCC) per discipline provides a further indication of how co-authorship in Flemish SSH has evolved during the years 2000-2010 and to what degree the ten disciplines engage in research collaboration through publications. The RCC in particular is considered a superior measure of collaboration through co-authorship. Besides capturing the degree of research collaboration and expressing it in a mathematically straightforward way (a value between 0 and 1) allowing for easy comparison (Egghe, 1991), the RCC correlates significantly with aspects of research 'quality' frequently associated with collaboration (Bukova, 2010; Katz & Martin, 1997). For example, RCC values have been found to correlate with journal impact factor and citation scores (Liao & Yen, 2012). Table 1 presents an overview of the observed changes and the RCC per discipline.

**Table 6.** Average number of authors per article (Collaboration Index, CI) and Revised Collaborative Coefficient (RCC), by discipline (2000-2010).

<b>Discipline</b>	<b>RCC</b>	<b>CI 2000-2010</b>	<b>CI 2000</b>	<b>CI 2010</b>	<b>Slope* 2000-2010</b>	<b>R<sup>2</sup></b>
Humanities	0.2	1.7	1.4	1.8	0.05	0.85
Social Sciences	0.6	3.6	2.8	4.0	0.13	0.97
History	0.1	1.3	1.3	1.4	0.01	0.05
Law	0.1	1.4	1.3	1.5	0.03	0.55
Linguistics	0.2	1.8	1.5	2.0	0.05	0.57
Philosophy	0.2	1.9	1.4	1.9	0.06	0.45
Political Science	0.3	1.9	1.4	2.1	0.06	0.80
Sociology	0.5	3.3	2.2	3.6	0.16	0.90
Economics & Business	0.5	3.0	2.6	3.3	0.08	0.92
Educational Sciences	0.5	3.1	2.9	3.4	0.05	0.59
Psychology	0.6	4.0	2.9	4.5	0.16	0.85
Social Health Sciences	0.7	5.5	4.5	5.8	0.14	0.83

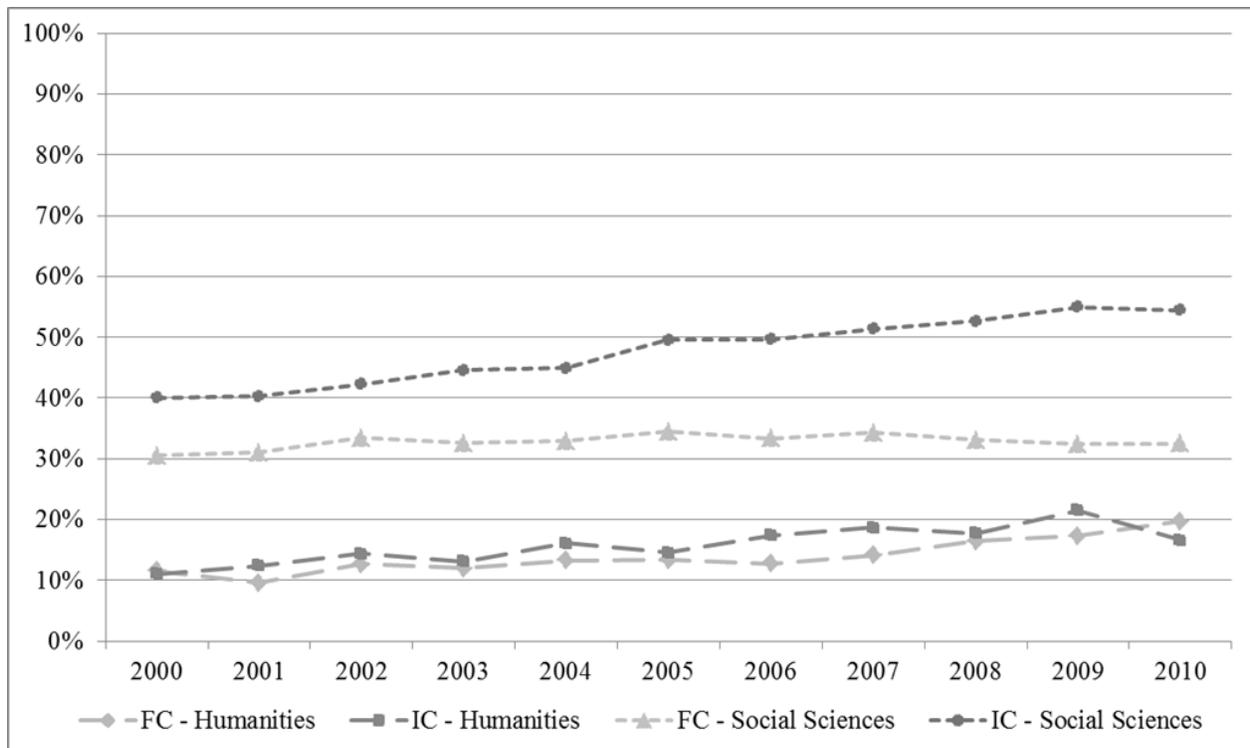
\* SLOPE: The slope has been calculated on the CI of each year for the given period (2000-2010)

Table 1 shows a considerable discrepancy between the Social Sciences and the Humanities. CI values for 2000-2010 indicate that on average a Social Science article has 1.9 authors more than a Humanities article. The RCC is 0.6 and 0.2 respectively. This confirms the higher degree of collaboration in Social Sciences concluded from multi-author article proportions in figures 1 and 2. The steepness, expressed by the slope, of the 2000-2010 CI-increase is not equally pronounced for all Social Science disciplines, though the increase for the Social Sciences as a whole has been steeper than for the Humanities. Sociology, Psychology and Social Health Sciences are the most collaborative and fastest evolving individual disciplines, History and Law seem to adhere much more to the ‘lone wolf’ model of traditional Humanities.

#### *Internationality of Collaboration*

In the remaining part of this paper, we investigate the internationality versus domesticity of Flemish SSH multi-authored articles. Leaving aside all single authored articles from our data set, two measures of internationality will be presented: 1° the proportion of internationally co-authored papers, 2° the international author fraction per paper (international, i.e. also comprising co-authors from the French and German speaking communities in Belgium).

Figure 3 presents the proportion of domestic Flemish collaborations (i.e. amongst only Flemish authors) (FC) and international collaborations (i.e. minimum one international author) (IC), both for the Social Sciences and the Humanities.



**Figure 5.** Proportion of international and Flemish domestic multi-author articles, by Social Sciences and Humanities (2000-2010).

The proportion of co-authored papers is increasing considerably sharper for Social Science international collaborations (IC–Social Sciences) than for Humanities international collaboration (IC–Humanities). Domestic Flemish co-authorship seems to be stable in the Social Sciences (FC–Social Sciences) but is on the rise in the Humanities (FC–Humanities). While humanities researchers appear to increase their collaborative efforts irrespective of their national/international character, social scientists seem to focus their effort on international co-publications.

The question to what degree this aspect of growing international collaboration is matched by an increase in the average international article fraction (i.e. the share of international co-authors per paper) is addressed in table 2, which provides an overview of the evolution of international article fractions per discipline for multi-authored papers.

**Table 7.** International fraction in multi-author articles, by discipline (2000-2010).

<b>Discipline</b>	<b>2000-2010</b>	<b>2000</b>	<b>2010</b>	<b>Slope*</b>	<b>R<sup>2</sup></b>
Humanities	0.27	0.24	0.24	0.00	0.02
Social Sciences	0.30	0.28	0.33	0.01	0.87
Economics & Business	0.30	0.30	0.31	0.00	0.17
Educational Sciences	0.19	0.30	0.20	-0.01	0.28
History	0.24	0.21	0.13	-0.01	0.13
Law	0.26	0.24	0.24	0.00	0.09
Linguistics	0.27	0.23	0.22	-0.01	0.18
Philosophy	0.27	0.14	0.31	0.01	0.53
Political Science	0.20	0.21	0.25	0.01	0.24
Psychology	0.29	0.25	0.36	0.01	0.65
Social Health Sciences	0.36	0.32	0.38	0.01	0.87
Sociology	0.28	0.20	0.30	0.01	0.82

\* SLOPE: The slope has been calculated on the average fractional count of each year for the given period (2000-2010).

Perhaps surprisingly, table 2 shows that although the 2000-2010 average international article fraction ranges from a considerable 1:5 to 1:3, for most disciplines there is no substantial increase in the share of international co-authors per article over time. For Educational Sciences, History and Linguistics, there even has been a minor decrease of the international author fraction. Neither does there appear to be a meaningful distinction between the Social Sciences and the Humanities, as Educational Sciences (0.19), Political Science (0.20) and Sociology (0.28) show international fractions below or about equal to those of Law (0.26), Linguistics (0.27) and Philosophy (0.27). Consequently, the trend towards more international collaboration in Figure 3 does not seem to result in the involvement of, on average, more international contributors. Although a higher proportion of multi-author articles results from an international collaboration, the average (measurable) contribution of international authors to these articles is not growing.

### **Discussion and Conclusion**

Based on full coverage VABB-SHW data for the period 2000-2010 this paper demonstrates the increasing occurrence of co-authorship within Flemish SSH article publications. Measured both by the increasing proportion of multi-authored articles and the growing average number of authors per article, the evolution towards more collaborative publications is manifest. This confirms international trends for SSH research (Ardanuy, 2012; Cronin & *al.*, 2003; Larivière & *al.*, 2006) However, in spite of this general increase of Flemish SSH co-authorship proportions, considerable differences remain: on average the Social Sciences have a higher proportion and growth rate of co-authored articles than the Humanities. Differences also exist between co-authorship occurrence in our two data subsets, VABB-WoS and VABB-GP. For all disciplines, WoS-indexed journals show a higher co-authorship proportion than the GP-approved journals, indicating the need for additional publication data to supplement co-authorship counts obtained from the WoS.

Internationality of collaborative publishing in Flemish SSH is on the rise when measured by the proportion of internationally co-authored articles. This is not the case when one considers the international author fraction per article. In other words, more internationally co-authored articles are published, but this does not imply that the average (measurable) contribution of international authors to these articles is significantly growing.

In comparison with data available for other countries (e.g. Canada, (Larivière & *al.*, 2006)) the proportion of Flemish SSH collaborations, especially in the Social Sciences, is relatively high, coming close to results more typical of the natural and biomedical sciences. Apart from a wider phenomenon of Belgian co-authorship proportions in various fields ranking amongst the highest in the world (Glänzel & *al.*, 2005), the high percentages can partially be explained by the introduction of the Flemish PRFS in 2003, which, through the use of a whole instead of a fractional counting schema has actively encouraged universities to collaborate in research. Between 2003 and 2010, this incentive has only been in place for co-authoring articles in WoS-indexed journals, as only these were then used in the PRFS for calculation of research funding (Engels & *al.*, 2012). It is, however, not unlikely that the counting schema used during this period for WoS-indexed publications has had an influence on Flemish scholarly publication culture in general, thereby stimulating co-authorship for non-WoS-indexed journal articles as well. As the universities after 2003 in all likelihood in their own right installed parallel publication incentives encouraging collaboration through co-authorship (Gläser & Laudel, 2007), this seems even more probable.

All in all, the findings presented here offer a first insight into research collaboration through co-authorship in Flemish SSH. Future VABB-SHW-based research on co-authorship will broaden the picture by focussing on different publication types, foremost authored and edited books. This will provide a more complete picture of collaborative publication practices in the SSH. For edited books such an analysis would probably prove to be methodologically more challenging, given the fact that collaboration in book publications, in particular in edited books with the role differentiation between editors and chapter contributors, is more complex. Ideally, data from the WoS' recently introduced Book Citation Index (Adams & Testa, 2011) can be used to determine whether the observed difference between our WoS-indexed and non-WoS-indexed journal article subsets is equally valid for book publications. Ultimately, when VABB-SHW-data will be contrasted with comparable data from other countries, the impact of the Flemish performance-based research funding system based on whole counts of publications can be compared to a fractional counting system (Sivertsen & Larsen, 2012; Ossenblok & *al.*, 2012). This would contribute greatly to our understanding not only of actual collaborative practices in the SSH, but also to the incentives encouraging researchers to further engage in them.

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