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Why do I publish research articles in English instead of my own language? Differences in Spanish researchers' motivations across scientific domains

Irene López-Navarro[1] · Ana I. Moreno[2] · Miguel Ángel Quintanilla[3] · Jesús Rey-Rocha[1]

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Abstract Previous studies have reported the increased use of English as the "lingua franca" for academic purposes among non-Anglophone researchers. But despite data that confirm this trend, little is known about the reasons why researchers decide to publish their results in English rather than in their first language. The aim of this study is to determine the influence of researchers' scientific domain on their motivation to publish in English. The results are based on a large-scale survey of Spanish postdoctoral researchers at four different universities and one research centre, and reflect responses from 1717 researchers about their difficulties, motivations, attitudes and publication strategies. Researchers' publication experiences as corresponding authors of articles in English and in their first language are strongly related to their scientific domain. But surprisingly, Spanish researchers across all domains expressed a similar degree of motivation when they write research articles in English. They perceive a strong association between this language and the desire for their research to be recognized and rewarded. Our study also shows that the target scientific audience is a key factor in understanding the choice of publication language. The implications of our findings go beyond the field of linguistics and are relevant

✉ Irene López-Navarro
irene.lopez@cchs.csic.es

Ana I. Moreno
ana.moreno@unileon.es

Miguel Ángel Quintanilla
maquinta@usal.es

Jesús Rey-Rocha
jesus.rey@csic.es

[1] Research Group on Scientific Evaluation and Transfer, Department of Science, Technology and Society, Spanish Council for Scientific Research (CSIC), C/Albasanz, 26-28, 28037 Madrid, Spain

[2] Department of Modern Philology, Universidad de León, Campus de Vegazana, s/n, 24071 León, Spain

[3] Science and Technology Studies Institute, Universidad de Salamanca, C/Espejo, 2, 37007 Salamanca, Spain

to studies of scientific productivity and visibility, the quality and impact of research, and research assessment policies.

Keywords Publication strategies · Non-Anglophone researchers · Researchers' motivation · Scientific domains · Academic writing · Research article

Introduction

English holds a preeminent position as the "lingua franca" in international scientific communication (European Commission 2003; Ammon 2003; Swales 2004; Lillis and Curry 2010). Although "the majority of the world's scholars do not possess English as their first language" (Flowerdew 2008: 77), the proportion of articles in this language authored by researchers whose first language is not English is increasing (Wood 2001; European Commission 2003; Swales 2004; Bordons and Gómez 2004; Benfield and Feak 2006; Flowerdew 2013). In this context, disparities and inequities in the distribution, audience and publishing practices in scientific journals are a matter of fact (Salager-Meyer 2008).

The implications of this situation were recently identified in several studies, which point in very different directions (see Uzuner 2008; Flowerdew 2013; Kuteeva and Mauranen 2014 for a review). Not surprisingly, the emphasis was initially on the consequences that seemed most obvious from the perspective of linguistics. The effect of gradual linguistic globalization for "smaller languages" which are affected by "standardising pressures in their semantic, textual, sociopragmatic and even lexicogrammatical construction" has already been noted by Gotti (2012: 60) and Gotti et al. (2002). Specifically, this "domain loss" (Preisler 2005; Ferguson 2007) results in the erosion and impoverishment of the scientific record in languages other than English (Ferguson 2013) and the exclusion of researchers who use English as an additional language (henceforth EAL) (Flowerdew 2013). A factor that contributes to this process of marginalization is rhetorical and stylistic transfer, i.e. the transfer of rhetorical and stylistic patterns of the individuals' first language (henceforth L1) to their writing in a second language (Ammon 2000; De Swaan 2001; Curry and Lillis 2004; ElMalik and Nesi 2008; Giannoni 2008; Moreno 2008, 2011; Lillis and Curry 2010).[1] This transfer results in texts that may deviate from the "strict English-medium policies adopted by many academic publications and book series" (Gotti 2012: 60). Ultimately this "exclusionary" view may reduce the chances of publication success (Hanauer and Englander 2011) and create potential biases against submissions by non-native English speaking researchers (Uzuner 2008).

The debate is now ongoing in the field of the "surprisingly under-explored topic" of English for Research Publication Purposes (ERPP) (Kuteeva and Mauranen 2014: 1), with discussions centring around two important, related topics: the disadvantages of using English as an additional language for researchers whose first language is not English, and the factors that influence their choice of language for academic publication.

In addition to the challenges noted above with regard to linguistic and discursive issues, some experts have claimed that EAL researchers face unfair extra efforts in terms of time

[1] In the field of contrastive rhetoric, this concept is based on the assumption that language learners will transfer the rhetorical or stylistic features of their native language to the target language, causing interference in second language writing (Connor 1996; Davies 2003).

and economic resources (Ammon 2001; Uzuner 2008; Burgess 2014) when trying to publish in English-medium journals. As Flowerdew noted, "whether or not they suffer discrimination, EAL writers are certainly at a disadvantage to L1 writers" (2008: 78). EAL researchers often have greater difficulties complying with international publication requirements, and may encounter negative bias by journal editors (as exemplified in Flowerdew 2001; Li and Flowerdew 2007). Other authors such as Canagarajah (1996) and Salager-Meyer (2008, 2014) emphasize that non-discourse-related problems faced particularly by researches in periphery countries (e.g. poor infrastructure, financial restrictions and outdated electronic libraries) can result in researchers remaining off network (Canagarajah 2002; Ferguson 2007).

These potential difficulties notwithstanding, it is well known that many non-Anglophone researchers reserve their best work for international mainstream journals published in English (Li 2014). This raises the question of what factors motivate the decision by researchers whose first language is not English to publish their research results in EAL rather than their L1.

In an attempt to further our understanding of these motivations, the aim in the present study is to analyse the extent to which researchers working in different scientific domains are motivated differently to publish in EAL and in their L1. More specifically, this paper examines the diversity of Spanish researchers' personal motivations for deciding to publish research articles in English or in Spanish, how these motivations vary across scientific domains, and the influence of their scientific community (i.e. the scientific discipline or field) in shaping their motivations. Thus, this study seeks to help remedy some of the methodological limitations identified in previous analyses, such as the focus on only some scientific areas and the lack of quantitative data.

This article is structured as follows. The next section reviews previous theoretical and empirical contributions about EAL researchers' motivations, including the framework we used in our previous work to study researchers' different motivations for communicating their research results in their L1 or EAL. We also review the role of scientific domains in shaping their motivations. Next, we describe our research methods. In the following section we present the main results of the study, report the different motivational profiles associated with each scientific domain, and identify common dimensions that underlie the patterns of motivation we identified. Finally, we discuss the main results and implications of our study of Spanish researchers' motivations.

Motivations involved in researchers' language choices for research publication

Despite the relevance of the language of publication and the implications of researchers' choices for measures of scientific production, the motivations for choosing to publish in a particular language are a subject that has not yet been well studied. However, in recent years a number of studies have highlighted non-Anglophone researchers' different motivations for publishing in EAL or L1. Positive attitudes and opinions toward the use of EAL for research publication purposes rely on and are justified by utility, scope, impact and visibility criteria (Petersen and Shaw 2002; Duszak and Lewkowicz 2008; Flowerdew and Li 2009; Li 2014; McGrath 2014). English, as the lingua franca of science, is the language most able to transcend national boundaries and enhance research impact. Moreover, publications in international mainstream journals have the additional value of fulfilling one

of the most important requirements for research assessment. Currently, publication in the so-called mainstream journals (published mainly in English) is the main criteria used by most evaluation agencies to assess research productivity and performance, both in Anglophone and non-Anglophone countries (Gibbs 1995; Wood 2001; Jiménez-Contreras et al. 2003; Osuna et al. 2011; Lam 2011; Salager-Meyer 2014). However, opting for publication in English means not only optimizing the returns derived from communication (Van Raan 1997; Bordons and Gómez 2004; Ferguson 2007) but also having to compete for a place in a select minority of crowded journals, to the detriment of local communication (Hamel 2007; Burgess 2014).

Despite the pragmatic approach to publishing that many non-Anglophone researchers have adopted, their responses when interviewed about the uses of English also reflect negative attitudes related mainly to the particular problems non-Anglophone researchers experience with the writing and submission process for research publication (see Uzuner 2008 for a review). Pressures to follow the rules of academic publishing ("publish or perish" ideology) have recently been reported by Salager-Meyer (2014), Li (2014) and Gentil and Séror (2014) among others, and McGrath (2014) has questioned whether the choice of language in which to publish research results really is a "choice" or not. In this connection, Flowerdew (2008) use the term "stigma" to refer to the feeling among many "EAL writers who have difficulty with producing written English at an acceptable level" (2008: 79). Other reasons that may lead researchers to publish in their L1 are related to responsibility, ideology and policy concerns, i.e. the decline of local journals, the loss of scientific vocabulary in languages other than English, the increasing marginalization of local issues and the diminishing dissemination of research findings in local contexts (Duszak and Lewkowicz 2008; Pérez-Llantada et al. 2011; Li 2014; Bocanegra-Valle 2014).

Surprisingly, this variety of attitudes and motivations toward writing in either EAL or L1 is seen consistently across geopolitical contexts, as reported in a number of recent country-specific studies in Italy (Giannoni 2008), Poland (Duszak and Lewkowicz 2008), China (Li and Flowerdew 2009), Portugal (Bennett 2010), Spain (Ferguson et al. 2011; Burgess 2014), Canada (Gentil and Séror 2014), Germany (Gnutzmann and Rabe 2014) and Sweden (McGrath 2014). Despite the wide range of views, two important insights and one caveat emerge from these studies.

Firstly, there is widespread "qualified acceptance" (Pérez-Llantada et al. 2011: 22) or even "resignation" (Ferguson et al. 2011: 54) among researchers regarding the dominance of English, irrespective of whether they hold a positive or negative attitude toward this language of publication. Secondly, positive and negative attitudes sometimes coexist within the same discourse, leading to ambivalence regarding researchers' motivations (Tardy 2004; Duszak and Lewkowicz 2008; Bocanegra-Valle 2014; Muresan and Pérez-Llantada 2014). The relevance of these contributions thus lies in that they have alerted scholars to the complexity and multidimensionality of this topic.

However, despite its relevance, little is known about the motivations of researchers for whom English is not their first language but who use it as an additional language to communicate the results of their research. Moreover, the complex manner in which different motivations operate and interact has yet to be investigated. One potential problem is that the findings of previous studies have not been compared and contrasted in depth, due to (among other factors) methodological limitations in systematic data collection and sample size (notwithstanding some exceptions such as Flowerdew 1999; Duszak and Lewkowicz 2008; Ferguson et al. 2011). The mainly qualitative approaches used thus far

have provided interesting descriptive findings, which are certainly suggestive but insufficient to identify deeper causal or explicative relations. A further limitation of qualitative studies is that they shed little light on the roles of different motivations in shaping researchers' attitudes and choices between EAL and L1, and fail to identify which variables have the greatest influence on these attitudes and motivations. The methodology used in this study constitutes an important contribution in this sense, with a larger-than-usual sample size and the use of a quantitative approach to enhance our understanding of the relationships between variables.

Another important caveat regarding studies done to date on researchers' motivations lies in the lack of a well-developed theoretical framework for constructing research instruments. Given the need for a more complex and carefully validated framework, in a previous study (López-Navarro et al. 2015) we discussed a proposal based on Self Determination Theory, one of the main theories of motivation in social psychology (Deci and Ryan 1985, 2000; Deci and Ryan 2002; Ryan and Deci 2000; Gagné and Deci 2005) which has recently begun to be applied to the study of researchers' motivations (Amabile et al. 1994; Lam 2011). This framework places researchers' motivations to publish research articles in EAL or their L1 on a continuum of self-determination according to: (a) the individual or collective nature of the sphere involved; (b) the type of motivation, i.e. amotivation, extrinsic or intrinsic; (c) the type of regulation along the continuum between self-determined and controlled forms of motivation, i.e. external, introjected, identified, integrated and intrinsic regulation; (d) the locus of causality, i.e. impersonal, external or internal; and (e) three types of outcomes: affective, social and material. The framework offers the advantage of overcoming the main theoretical and methodological shortcomings of earlier studies of researchers' motivations by considering motivation as a dynamic, multidimensional process integrated at various levels, as recommended by earlier authors who have used this approach (Ferguson et al. 2011; Gotti 2012). Our survey was designed with this theoretical framework in mind, and validated in a robust sample (Moreno et al. 2013; López-Navarro et al. 2015).

Aside from these limitations, in the last few years a speculative discussion has begun with some interesting empirical contributions regarding the influence of different variables on the decision to publish in EAL or L1. The early stages of this discussion focused on linguistic aspects such as the level of researchers' English language proficiency. But lately a significant group of authors has claimed that the issues related to the use of English for academic publication go beyond the artificial native versus non-native dichotomy (Swales 2004; Ferguson et al. 2011; Flowerdew 2013; Kuteeva and Mauranen 2014), although empirical contributions have not always confirmed this claim (Coates et al. 2002; Man et al. 2004). What seems increasingly evident is that other social determinants exist that impact the language choices of multilingual scholars, e.g. publication experience (López-Navarro et al. 2015), professional expertise and academic seniority (Flowerdew 2013), issues of social and cultural identity (ElMalik and Nesi 2008; Flowerdew 2008; Swales and Leeder 2012), linguistic loyalty (Duszak and Lewkowicz 2008) and location in the centre versus the periphery (Salager-Meyer 2008; Burgess 2014). Among these determinants, disciplinary practices within and across national boundaries emerge in recent studies as one of the most decisive variables that impact on researchers' motivations and publication practices (Petersen and Shaw 2002; Ferguson 2007; Duszak and Lewkowicz 2008; Kuteeva and Mauranen 2014).

Influence of the scientific domain

There is ample evidence of how contextual features (such as team characteristics, organizational setting, research field, etc.) influence different aspects of scientist's work and performance. We will not review here the existing literature and main findings on this topic, but refer the reader to reviews by Long and McGinnis (1981), Smith et al. (1994), Cohen and Bailey (1997), Dundar and Lewis (1998), Carayol and Matt (2004), Smeby and Try (2005), Rey-Rocha et al. (2006), Martín-Sempere et al. (2008) and Huang et al. (2011).

Many studies have emphasized how individuals' behaviour is shaped and constrained by the social networks in which they are embedded (Granovetter 1973; Granovetter 1985).[2] The choice of language for academic publication is also shaped by this embeddedness and influenced by these social and contextual features. In this connection, Swales and Leeder (2012: 137) note that belonging to a particular scientific field involves "apprenticeship and acculturation to a disciplinary community where, behind the textual surface, the largely unwritten 'rules of the game' as well as defensible levels of knowledge claims need to be apprehended and acted upon". These authors recall the words of Hyland (2009: 88), who notes that research articles are "sites of disciplinary engagement". In this sense, researchers have different value orientations[3] depending on the scientific domain they work in, and that affect their knowledge dissemination practices. Scientific communities from different fields or disciplines may have distinct academic cultures with different values, attitudes and experiences, which may be more or less endo- or exocentric, more or less internationalized and anglicized, and more or less 'anglophone' or 'local-language-oriented' (Petersen and Shaw 2002; Kuteeva and Airey 2013). These features give rise to different patterns of activity, different language-of-publication patterns, and different writing genres, production processes and time scales (Swales 1998; Rey-Rocha et al. 1999; Gnutzmann and Rabe 2014). As a result, different scientific disciplines or fields can be identified as different 'discourse communities'[4] based on their different use of the languages of reading and writing and their patterns of relationship between international and local communities when the language of the latter differs from that of the former (Petersen and Shaw 2002).

These considerations about the scientific domain as a socially embedded community lead us to consistently link our framework for investigating researchers' motivations with the influence of their scientific domain. As pointed out by Lam (2011: 1355), Self Determination Theory posits that "individuals' motives for behaviour and their responses to different kinds of rewards are influenced by the degree of congruence between their personal values and those underlying the activity", thus "individuals can be extrinsically or

[2] "The argument of embeddedness" (Granovetter 1985: 481) states that behaviours and institutions are constrained by ongoing social relations.

[3] Webster's Dictionary (http://www.webster-dictionary.org) defines 'value orientation' as "principles of right and wrong that are accepted by an individual or a social group". According to McCarty and Hattwick (1992: 34), "cultural value orientations represent the basic and core beliefs of a culture; these basic beliefs deal with human's relationships with one another and with their world".

[4] The concept of 'discourse community' is widely used in the literature on multilingual researchers' international publication practices. Swales (1990: 29) uses this notion to describe a group of individuals defined by six characteristics: "common goals, participatory mechanisms, information exchange, community-specific genres, a highly specialized terminology and a high general level of expertise".

intrinsically motivated to different degrees in their pursuit of an activity depending on how far they have internalized the values and regulatory structures associated with it".

In addition to the literature about the cultural features of research fields, we also have ample empirical evidence for the existence of differences between fields. With regard to academic publication, we can thus assume that differences across disciplines do exist. Bibliometric studies have long noted that although there is a general trend toward 'anglosaxonization', differences can be identified among both research fields and disciplines (Petersen and Shaw 2002; Ammon 2003; Swales 2004; Fergusson 2007; Kronegger et al. 2011). There is a certain consensus that a relationship exists between the audiences being addressed, the scope of the research and the discipline (Frame and Carpenter 1979; Sanz et al. 1995; Rey-Rocha and Martín-Sempere 1999; Ferguson 2007). More specifically, research on basic aspects of nature is viewed as being most likely to be of interest to an international readership, whereas research conducted in Social Sciences and Humanities is generally more locally oriented. It is assumed that researchers working in the former domains "share the same knowledge, scientific interests and concerns all over the world", whereas in Social Sciences and Humanities, "cultural, linguistic and historical features play an important role" (Bordons and Gómez 2004: 190). Research publishing in these latter two domains is also influenced by an additional ethical dimension, "in that there is a duty to make research accessible to the communities studied as far as possible" (McGrath 2014: 13). Therefore the target audience based on the type of knowledge generated is likely to be one of the drivers of the choice of language and more generally the publishing strategy used by the authors. In this connection, several studies have justified the bibliometric relevance other languages still have in specific "local and culture-encumbered" scientific domains (Ferguson 2007: 17) in the Humanities and Social Sciences (Swales 1990; Petersen and Shaw 2002; Ferguson 2007; Flowerdew and Li 2009; Burgess et al. 2014).

From a linguistic viewpoint, differences have been found among scientific domains in relation to the use of specific rhetorical and discursive conventions (Fagan and Burgess 2002; Swales 2004; Hyland and Bondi 2006; Gotti 2012) and particular argumentation strategies (Hyland 2009, 2013; Maci 2012; Gnutzmann and Rabe 2014). However, less empirical evidence is available for the relationships between different scientific domains and attitudes toward the use of English as an additional language. These relationships are only occasionally taken into consideration and frequently occupy a secondary position in the research (Flowerdew 1999). In some studies published to date, the results are merely descriptive, both in studies that used qualitative (McGrath 2014; Pérez-Llantada et al. 2011; Gnutzmann and Rabe 2014; Li and Flowerdew 2009; Kuteeva and Airey 2013) and quantitative methodologies (Duszak and Lewkowicz 2008; Bolton and Kuteeva 2012; Anderson 2013). However, these valuable results highlight the influence of disciplinary cultures on the writing and publishing process (Gnutzmann and Rabe 2014), on social practices (Anderson 2013) and social needs (Vázquez and Giner 2008), and even on the perception of language competence for research publication purposes (Petersen and Shaw 2002). An exception worth noting to the general trend in such research is a report by Ferguson et al. (2011), whose findings show a non-significant association between attitudes and scientific domain. Despite these contrasting results—or perhaps because of them—and the methodological limitations of previous work notwithstanding, some authors have called for further research on this topic (Gnutzmann and Rabe 2014; Kuteeva and Mauranen 2014; Duszak and Lewkowicz 2008).

Methods

This paper draws on data from a study by the ENEIDA (Spanish Team for Intercultural Studies on Academic Discourse) research team of the current needs, experiences and strategies of Spanish researchers with regard to writing and publishing research articles in English- and Spanish-medium journals. Our analysis is based on responses to a large-scale on-line survey of Spanish researchers with doctorates who received most of their secondary and pre-doctoral education in Spain and in Castilian Spanish, and who work at either a research-only institution (affiliated with the Spanish Council for Scientific Research) or at one of four Spanish universities. In addition, respondents had to have served as corresponding author on at least one research article, either in L1 or in EAL.

The population of participants, the general aspects of the methodology and the design, validation and implementation procedures of the survey were described in detail by Moreno et al. (2012, 2013). A full version of the ENEIDA Questionnaire is available at Moreno et al. (2013). To facilitate comprehension of the present article, key methodological aspects of the study are summarized below. We also offer further details of our methodology for the analysis reported here.

After face-to-face interviews with a selected sample of 24 informants and a pre-test of the questionnaire, we carried out an on-line questionnaire survey in late 2010 by e-mailing the web-based questionnaire to 8794 academics. We received 1717 responses (19.6 % response rate). Of these, 1454 (84.7 %) met our L1 and educational background criteria. Both genders were adequately represented among respondents, reflecting the percentage distribution of women and men in the population. The response rate was higher among Spanish Council for Scientific Research surveyees (21.3 %), who were thus over-represented in our sample with respect to university academics. The response rates from the four participating universities ranged from 10.6 to 13 %.

We asked informants about the number of research articles they had published as corresponding author in English and in Spanish during the previous 10 years (survey question 12). Our informants were the corresponding authors, who, we assumed, were responsible for writing and submitting the article. We further assumed that responsibility for this role was an indicator of the writers' publication experience and their likely familiarity with the writing conventions in their discipline, both in Castilian Spanish and in English writing cultures. This item provided information about the language they used most frequently to write their manuscripts.

We asked informants to assess how motivated they feel when they write up the results of their research for journals published in Spanish or in English (survey question 20). We posed the question using a seven-point semantic differential scale ranging from 3 (very motivated) to −3 (very unmotivated). We also asked participants to indicate to what extent fourteen different motivations influenced their decision to publish in English or Spanish (survey question 13). The motivations for which we sought information through this item are shown in Table 1. They were described previously and plotted along the continuum from extrinsic to intrinsic (López-Navarro et al. 2015). The respondents provided their answers on a five-point Likert scale ranging from 1 (not at all) to 5 (a lot).

We estimated the position index (PI) for each of the fourteen motivations. The footnote to Fig. 1 provides a description of the PI and how it was plotted. The formula used to estimate PI is reported in Appendix 1.

To compare the distribution of average scores for different motivations, we generated a response profile for each domain that comprised the distribution of responses to each item, and plotted the distances between scientific domain profiles in a plane with Proximity

Table 1 Motivations

Intrinsic motivations	
StiChll	My desire for stimulating challenges
ItlDevl	My desire to develop intellectually (as a result of editors' and peer reviewers' comments)
WrtImpr	My desire to improve my writing ability in this language
WrtAbil	My assessment of my ability to write up the results of my research in this language
ArtQual	My assessment of the quality of my article
PubExpr	My experience publishing in this language
Extrinsic motivations	
IntComm	My desire to communicate the results of my research to the international scientific community
LocComm	My desire to communicate the results of my research to the local community
JouExst	My desire for the continued existence of scientific journals in this language
RspInvt	My desire to respond to a request or invitation from an institution, association or publisher, etc.
Citations	My desire to get cited more frequently
ResRcgn	My desire for my research work to be recognized
PrfProm	My desire to meet the requirements for professional promotion
BonPaym	My desire to increase my chances of receiving a bonus payment

Scaling (PROXSCAL). A detailed description of how these distances are calculated is provided in Appendix 2.

Finally, in order to identify common dimensions underlying different motivations for publishing in English or Spanish, we performed factor analysis with principal component extraction for all fourteen motivations. This process included varimax rotation with Kaiser normalization. The result was a set of orthogonal (i.e. uncorrelated) factors formed by highly correlated variables. We conducted factor analyses separately for motivations to publish in English or Spanish; orthogonally rotated factors were considered constructs of motivation. To assess the internal consistency of the two multi-item factors, we calculated Cronbach's alpha. One-way ANOVA was used to examine the variation of motivational factors across the four broad scientific domains to which we assigned our informants.

Scientific domain is viewed here as an explanatory variable. We asked surveyees to provide the UNESCO codes that best described their research field. These codes represent scientific subdisciplines (six-digit codes), disciplines (four digits) and fields (two digits) of the UNESCO International Standard Nomenclature for Fields of Science and Technology (UNESCO 1988). For the purposes of this paper, we grouped these codes into four broad domains: Natural and Exact Sciences (NE), Technological Sciences (TS), Social Sciences (SS) and Arts and Humanities (AH). We assigned each participant to a single domain, as described in Appendix 3, according to the thematic profile indicated by the UNESCO codes chosen. Of the 1454 respondents, 1417 could be assigned to a single, univocal scientific domain (Table 2).

We used SPSS software for Windows (version 19.0) for all statistical analyses.

Results

As expected, researchers' experiences as the corresponding author of articles in EAL and in their L1 varied across the four scientific domains (Table 3). Broad similarities were apparent between NE and TS researchers, on one hand, and between SS and AH

Table 2 Sample composition by scientific domain

	n	Percentage	Valid percentage
Natural and Exact Sciences (NE)	817	47.6	56.2
Technological Sciences (TS)	245	14.3	16.9
Social Sciences (SS)	237	13.8	16.3
Arts and Humanities (AH)	118	6.9	8.1
Not classified[a]	37	2.2	2.5
Total	1454	84.7	100
No response[b]	263	15.3	
Total	1717	100	

[a] The participants in this category selected UNESCO codes from three or more domains, and could not be allocated to a specific domain

[b] Individuals excluded from the analysis either because Castilian Spanish was not one of their first languages, or because they did not receive most of their predoctoral education and training in Spain and in this language

Table 3 Researchers who published journal articles as corresponding author in English or Spanish during the previous 10 years, by scientific domain

Domain	*n*	% of researches that published in[a]					Average number of articles in	
		English	Spanish	Both	None	Total	English	Spanish
							Mean ± standard deviation (range) median	
Natural and Exact Sciences (NE)	817	50.2	1.8	44.9	3.1	100	20.6 ± 25.8 (0–200) 12	3.0 ± 6.6 (0–75) 0
Technological Sciences (TS)	245	48.2	1.6	47.8	2.4	100	19.9 ± 24.2 (0–200) 11	2.6 ± 5.6 (0–50) 0
Social Sciences (SS)	237	3.0	30.4	65.8	.8	100	4.8 ± 7.1 (0–47) 2	13.5 ± 14.7 (0–100) 9
Arts and Humanities (AH)	118	2.5	34.7	62.7	.0	100	3.9 ± 5.9 (0–34) 2	18.8 ± 15.9 (0–81) 20

[a] $\chi^2 = 428.3$; p value = .000

researchers on the other. During the previous 10 years, 95 % of NE researchers and 96 % of TS researchers published at least one article as corresponding author in English, whereas 65 % of AH and 69 % of SS researchers reported submitting at least one manuscript as corresponding author. NE and TS researchers tended to publish exclusively in English or in both languages. In contrast, most SS and AH researchers tended to publish in both languages or only in Spanish. Furthermore, NE and TS researchers published a significantly higher average number of research articles in English than their SS and AH colleagues.

Despite the different publication patterns noted above, researchers in all scientific domains felt equally motivated on average when they write research articles in English (from fairly to very motivated) (Table 4). However, AH researchers felt significantly more motivated when writing in Spanish (from fairly to very motivated) than SS (a little to fairly motivated), and these latter in turn felt more motivated than their TS and NE counterparts

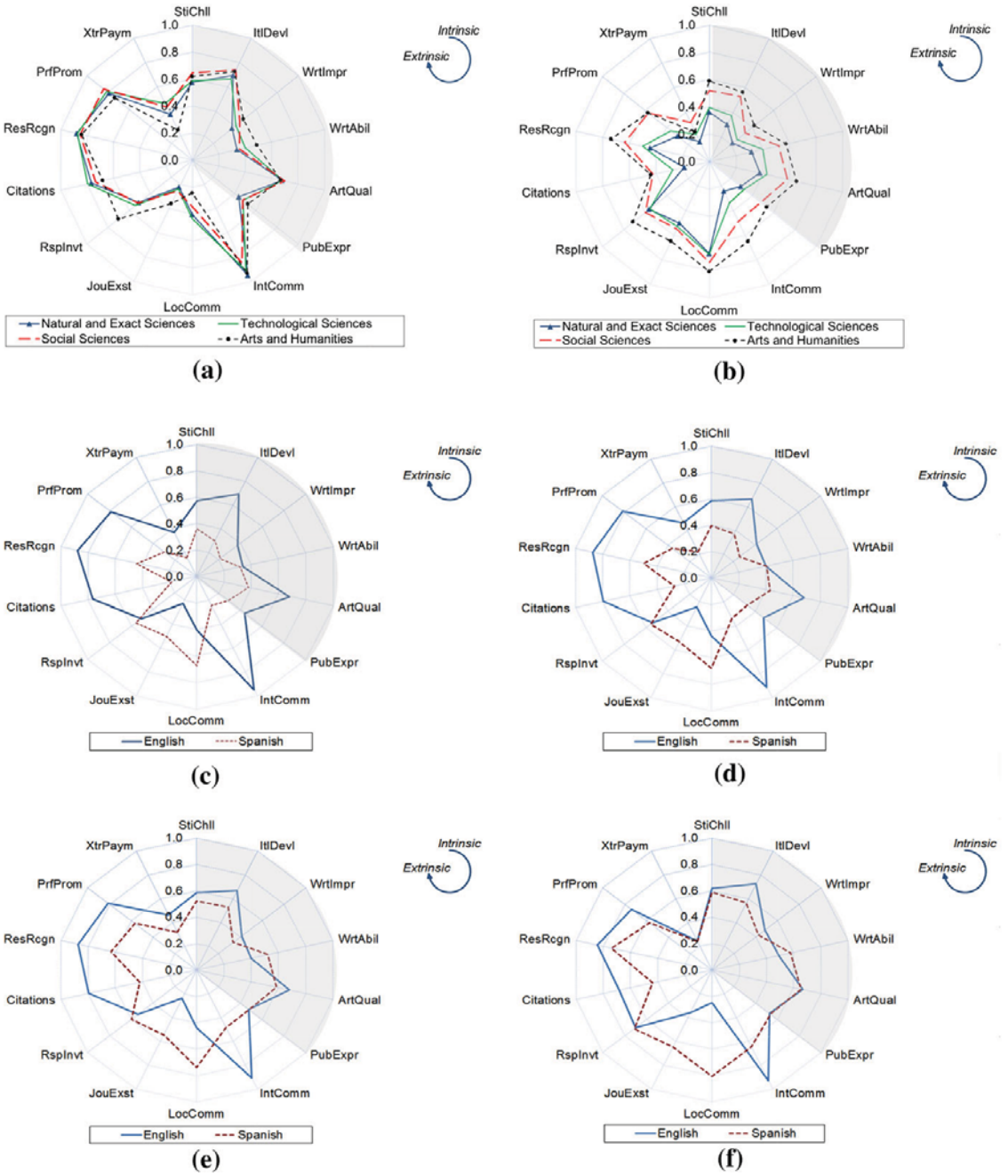


Fig. 1 Graphs of the Position Index of motivations for publishing in English or in Spanish. **a** All scientific domains, English. **b** All scientific domains, Spanish. **c** Natural and Exact Sciences, English versus Spanish. **d** Technological Sciences, English versus Spanish. **e** Social Sciences, English versus Spanish. **f** Arts and Humanities, English versus Spanish. Motivations: see Table 1. Position Index (PI): The PI, which can take any value from 0 to 1 inclusive, quantifies the position of the sample on an ordinal scale without having to take into account the number of categories in the scale. The value of the index is null (PI = 0) when the sample is located at the lower end of the range, and is maximal (PI = 1) when all the elements of the sample are at the top. This index makes it possible to plot a motivational profile graph for each scientific domain, which illustrates the 'shape' of each domain as well as similarities and differences among domains. The formula used to estimate PI is reported in Appendix 1. Shaded sectors include intrinsic motivations

(neutral to a little). The only researchers who felt equally motivated when writing in either language were those in the AH domain, whereas the rest of our informants reported feeling significantly more motivated when writing in English.

Table 4 How do you feel when you write up the results of your research for publication in journals in Spanish or in English?[a]

Natural and Exact Sciences (NE)		Technological Sciences (TS)		Social Sciences (SS)		Arts and Humanities (AH)		Across-domain differences
English $n = 777$	Spanish $n = 382$	English $n = 235$	Spanish $n = 121$	English $n = 228$	Spanish $n = 163$	English $n = 115$	Spanish $n = 77$	
2.2 ± 1.2 (*)	.6 ± 1.8	2.1 ± 1.2 (*)	.7 ± 1.9	2.1 ± 1.4 (*)	1.8 ± 1.3	2.3 ± 1.1	2.3 ± 1.1	Spanish: AH > SS > (TS, NE)

Mean values were compared with Student's *t* test with Bonferroni correction. Significant differences are reported at $p < .05$ in the two-sided test of equality for column means, assuming equal variances

Intra-domain differences: (*) = English > Spanish

[a] Scale (semantic differential): 3 = very motivated; 2 = fairly motivated; 1 = a little motivated, 0 = neutral; −1 = a little unmotivated; −2 = fairly unmotivated; −3 = very unmotivated. Figures are expressed as the mean ± standard deviation

In the following sections we will analyse the different motivations behind the decision to publish research articles in English as opposed to Spanish. Table 5 summarizes the descriptive statistics for how researchers in different scientific domains rated each of the motivations to publish research articles in English- or Spanish-medium journals. Differences in the motivations for writing in English vs. Spanish were evident within each domain, as well as across domains. Figure 1 illustrates the 'motivational profile' of each domain by plotting the position index of the weighted rates for each motivation. Figure 2 summarizes the results of PROXCAL analysis by locating each of the four domains in a plane and showing the distances between them.

As these tables and figures show, the three main motivations for publishing in English were the same for researchers in all scientific domains. They published in this language mainly because they wished (i) to communicate the results of their research to the international scientific community, (ii) to have their research work recognized, and (iii) to meet the requirements for professional promotion.

In all domains, the main motivation to publish research articles in Spanish was the desire to communicate research results to the local scientific community. This was the only motivation that was scored highly (around 4, quite a lot) by all respondents, although significant differences were found between NE and AH researchers. Researchers in the latter domain also chose to publish in Spanish driven largely by a desire to respond to requests or invitations to publish from an institution, association or publisher. They were significantly more motivated by this reason than the rest of researchers, regardless of whether they chose to publish in Spanish or in English. AH researchers also saw the Spanish language as an important way to communicate to international scientific audiences and seek recognition. Thus, when they considered their articles to be good enough, they were as motivated to publish them in Spanish as in English.

Discourse about their motivations to publish research articles in English was quite homogeneous among respondents. The motivational profile for publishing in English as represented by the position index was similar (Fig. 1a), with the most evident differences for some motivations appearing between AH and the other three domains. As shown, researchers in all domains concurred that using English rather than Spanish was associated with greater intellectual feedback, broader international diffusion and more citations, recognition and possibilities for professional promotion. In this connection, extrinsic-individual motivations had more influence on the decision to publish in English than in Spanish. The only exception were AH researchers, for whom the desire to increase the chances of receiving a bonus payment was an equally weak drive for publishing in either language. The responses about motivations to publish in Spanish were more heterogeneous (Fig. 1b). The NE and TS domains were close together in the graph, whereas the SS and AH domains were further apart and indicated a generally higher degree of motivation for practically every item.

The results of the PROXSCAL analysis summarized in Fig. 2 provide a picture of the general motivational profile for each domain and language. Comparison of the 'response profiles' shows that the motivation to publish in English clearly separated NE and TS from AH in the second dimension, with SS somewhere in between. Regarding the motivations to write in Spanish, NE and TS also appeared close together, with SS slightly apart in the first dimension and AH clearly separate in both dimensions. The graph also shows larger differences between motivations to publish in English or in Spanish among NE researchers, followed by TS and SS, whereas for AH researchers, the motivations to publish in either language were more similar (see also Fig. 1c–f).

Table 5 When you decide to publish a research article in a scientific journal, to what extent do the following factors influence your decision to publish in Spanish or in English?[a]

Motivations[b]	Natural and Exact Sciences (NE)		Technological Sciences (TS)		Social Sciences (SS)		Arts and Humanities (AH)		Across-domain differences
	English $n = 777$	Spanish $n = 382$	English $n = 235$	Spanish $n = 121$	English $n = 163$	Spanish $n = 228$	English $n = 77$	Spanish $n = 115$	
Intrinsic motivations									
StiChll	3.3 ± 1.5 (*)	2.4 ± 1.5	3.4 ± 1.3 (*)	2.7 ± 1.5	3.5 ± 1.5 (*)	3.1 ± 1.4	3.5 ± 1.6	3.4 ± 1.5	Spanish: (AH, SS) > NE; AH > TS
ItlDevl	3.8 ± 1.3 (*)	2.2 ± 1.3	3.7 ± 1.3 (*)	2.5 ± 1.4	3.9 ± 1.2 (*)	3.1 ± 1.3	3.9 ± 1.2 (*)	3.3 ± 1.4	Spanish: (AH, SS) > (NE, TS)
WrtImpr	2.5 ± 1.5 (*)	1.9 ± 1.3	2.8 ± 1.5 (*)	2.3 ± 1.4	2.8 ± 1.5 (*)	2.4 ± 1.4	3.0 ± 1.6	2.7 ± 1.7	Spanish: (AH, SS) > NE
WrtAbil	2.3 ± 1.4	2.3 ± 1.5	2.7 ± 1.4	2.8 ± 1.6	2.4 ± 1.4	3.1 ± 1.5 (**)	3.1 ± 1.5	3.3 ± 1.7	English: (AH, TS) > NE; AH > SS Spanish: SS > NE
ArtQual	3.7 ± 1.5 (*)	2.5 ± 1.5	3.8 ± 1.4 (*)	2.9 ± 1.5	3.8 ± 1.4	3.4 ± 1.4	3.7 ± 1.5	3.6 ± 1.5	Spanish: (AH, SS) > NE; AH > TS
PubExpr	2.7 ± 1.5 (*)	2.2 ± 1.4	3.0 ± 1.5 (*)	2.4 ± 1.4	2.9 ± 1.4	3.0 ± 1.5	3.1 ± 1.4	3.2 ± 1.5	Spanish: (AH, SS) > NE; AH > TS
Extrinsic motivations									
IntComm	4.8 ± .6 (*)	2.0 ± 1.3	4.6 ± .7 (*)	2.5 ± 1.4	4.4 ± 1.0 (*)	3.0 ± 1.4	4.8 ± .6 (*)	3.7 ± 1.3	English: NE > (TS, SS); AH > SS Spanish: AH > (SS, TS, NE); SS > NE
LocComm	2.6 ± 1.5	3.7 ± 1.5 (**)	2.6 ± 1.4	3.9 ± 1.4 (**)	2.4 ± 1.4	4.0 ± 1.2 (**)	2.0 ± 1.2	4.3 ± 1.2 (**)	English: NE > AH Spanish: AH > NE
JouExst	1.9 ± 1.3	3.0 ± 1.6 (**)	2.0 ± 1.2	3.4 ± 1.5 (**)	2.0 ± 1.3	3.2 ± 1.5 (**)	2.4 ± 1.6	3.6 ± 1.5 (**)	English: AH > NE Spanish: AH > NE

Table 5 continued

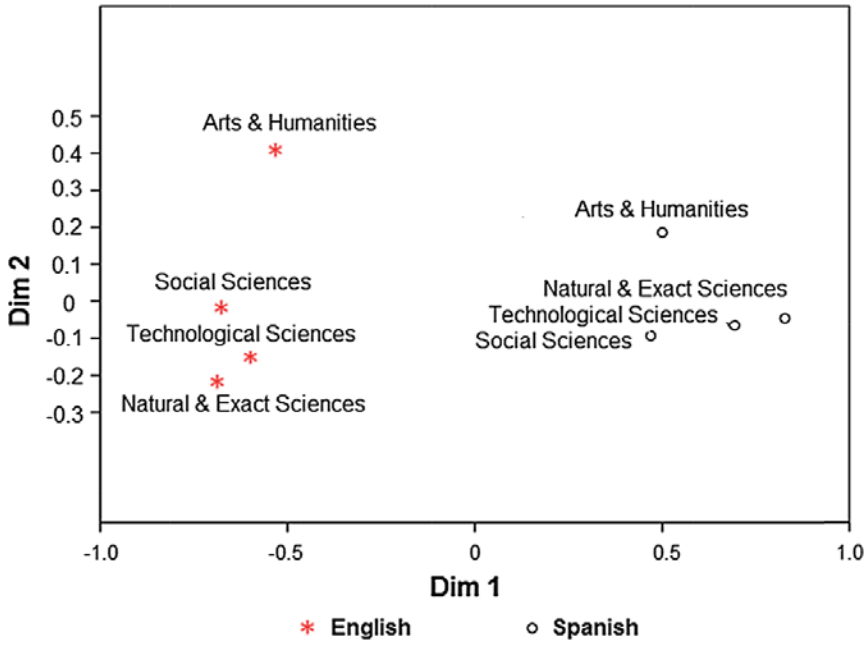
Motivations[b]	Natural and Exact Sciences (NE)		Technological Sciences (TS)		Social Sciences (SS)		Arts and Humanities (AH)		Across-domain differences
	English $n = 777$	Spanish $n = 382$	English $n = 235$	Spanish $n = 121$	English $n = 163$	Spanish $n = 228$	English $n = 77$	Spanish $n = 115$	
RspInvt	3.0 ± 1.4	3.2 ± 1.4 (**)	3.1 ± 1.3	3.0 ± 1.4	3.1 ± 1.5	3.4 ± 1.3 (**)	3.9 ± 1.4	3.8 ± 1.3	English: AH > (TS, SS, NE) Spanish: AH > (SS, NE, TS)
Citations	4.1 ± 1.2 (*)	1.7 ± 1.2	4.3 ± 1.1 (*)	2.2 ± 1.3	3.9 ± 1.3 (*)	2.7 ± 1.3	3.7 ± 1.3 (*)	2.8 ± 1.3	English: TS > AH Spanish: AH > TS > NE; SS > NE
ResRcgn	4.5 ± .9 (*)	2.7 ± 1.5	4.5 ± .8 (*)	3.1 ± 1.4	4.4 ± .9 (*)	3.5 ± 1.3	4.4 ± .9 (*)	4.0 ± 1.2	Spanish: AH > (SS, TS, NE); SS > NE
PrfProm	4.2 ± 1.1 (*)	2.2 ± 1.3	4.4 ± 1.1 (*)	2.5 ± 1.4	4.4 ± 1.0 (*)	3.3 ± 1.4	4.0 ± 1.1 (*)	3.3 ± 1.4	Spanish: (AH, SS) > (TS, NE)
BonPaym	2.5 ± 1.5 (*)	1.6 ± 1.0	2.9 ± 1.5 (*)	2.0 ± 1.2	2.7 ± 1.6 (*)	2.3 ± 1.3	1.9 ± 1.4	2.0 ± 1.2	English: (TS, SS, NE) > AH Spanish: SS > NE

Means were compared Student's *t* test with adjustment by Bonferroni correction. Significant differences are reported at $p < .05$ in the two-sided test of equality for column means, assuming equal variances

Intra-domain differences: (*) = English > Spanish, (**) = Spanish > English

[a] Scale: 1 = not at all; 2 = a little; 3 = to and average extent; 4 = quite a lot; 5 = a lot. Figures are expressed as the mean ± standard deviation

[b] Legend: see Table 1



Adjustment and stress measures [a]	Statistics
Normalized raw stress	.001
Stress-I	.042
Stress-II	.084
S-Stress	.002
Dispersion accounted for (DAF)	.998
Tucker's coefficient of congruence	.999

Fig. 2 PROXSCAL analysis of motivations for publishing in English or in Spanish. [a] Values suggest a good fit of the model. 'Stress' measures model adjustment, ranging from zero when there is no relation to 1 when distances are exactly proportional. Good fit is indicated by low values of S-stress (<.15) and values close to 1 for dispersion accounted for (DAF) and Tucker's coefficient of congruence

To identify the common dimensions underlying motivations to publish in English or Spanish, we used factor analysis. This method made it possible to collapse the information on motivations into a range of factors, and had the further advantage of allowing us to analyse the relationships between the various elements of the multidimensional, dynamic phenomenon of motivation.

Motivations to publish in English

In the factor analysis of motivations for publishing in English (Table 6), a default eigenvalue cut-off of one was initially used, but this generated three factors, one of which was not easily interpretable. A five-factor solution was subsequently used for the data, which resulted in a much clearer factor structure. This analysis explained 66.7 % of the variance (see Appendix 4, Table 10), and revealed two distinct motivations: the desire to communicate results to the local community, and the desire to respond to a commission or invitation from an institution, association or publisher. Each of these motivations was identifiable as a different single-item factor with the highest extraction values among all motivations: 91 % for communicating results to the local community and 84.1 % for responding to an invitation (Appendix 4, Table 11). The remaining motivations resolved as three multi-item factors.

Table 6 Descriptive statistics and the factor analysis results for motivations to publish in English

Rotated component matrix[a]					
Motivations[d]	Components[b,c]				
	F1 Professional expertise	F2 International communication and recognition	F3 Rewards	F4 Local communication	F5 Invitations
WrtImpr	.83				
WrtAbil	.82				
PubExpr	.80				
ArtQual	.66				
JouExst	.63				
StiChll	.57				
IntComm		.83			
ResRcgn		.68			
PrfProm			.84		
BonPaym			.67		
Citations			.61		
LocComm				.93	
RspInvt					.87
ItlDevl					

[a] Extraction method: principal component analysis. Rotation method: Varimax with Kaiser normalization. Rotation converged in 6 iterations

[b] Only factorial loads >.5 are shown

[c] Appendix 4 summarizes the factorial analysis model, the variance accounted for by each variable, and correlations among variables

[d] Legend: see Table 1

The central theme of factor 1 focused on motivations related to professional expertise in writing research articles. Most of the items that made up this factor were concerned with linguistic competence and the capacity to produce quality research articles, reflecting the need for achievement and self-confidence. Thus factor 1 reflected the need for individual intrinsic satisfaction, e.g. the satisfaction obtained from puzzle-solving as proposed by Lam (2011). A high score on this factor reflected authors' self-confidence with regard to their experience of publishing in English, and their ability to write in this language; it also indicated a desire to enhance this ability. A high score on factor 1 also reflected the author's self-confidence with regard to the quality of a manuscript. An additional item that made a smaller contribution to this factor concerned the social and affective dimension related to the continued existence of scientific journals in this language.

Factor 2 centred on the desire to communicate research results to the international scientific community. The two items grouped in this factor indicated a desire for research to be internationally disseminated and recognized—two motivations related with social outcomes that have been internalized through the research assessment system. This factor was thus concerned with international transcendence, visibility and recognition. The relationships between these two items and their inclusion in the same factor indicated that

researchers identified recognition for research work as being linked to communication to the international scientific community, regardless of the language used for communication—as explained below, it was also linked in the factor analysis of motivations to publish in Spanish.

Factor 3 focused on motivations related with the reward system of science, as represented by the main explicit rewards obtained by researchers for publishing in English-medium journals. This factor comprised three items reflecting the Mertonian paradigm of competence through recognition by peers. All three were instrumental, extrinsic motivations that included the so called 'ribbon' and 'gold' rewards (Merton 1973; Lam 2011).

The desire to develop intellectually as a result of editors' and peer reviewers' comments had the lowest extraction value (.45) and was thus the least clearly explained motivation (see Appendix 4, Table 11). Consequently it did not fit neatly into any of the factors. Omitting this motivation, however, did not significantly modify the results of factor analysis.

Motivations to publish in Spanish

To examine the motivations to publish in Spanish, we used a five-factor solution for the data (Table 7). The results explained 75 % of the variance (see Appendix 4, Table 10).

Table 7 Descriptive statistics and the factor analysis results for motivations to publish in Spanish

Rotated component matrix[a]					
Motivations[d]	Components[b,c]				
	F1 Professional expertise	F2 International communication, recognition, and noneconomic rewards	F3 Economic reward	F4 Local communication	F5 Invitations
WrtAbil	.80				
WrtImpr	.77				
PubExpr	.75				
ArtQual	.61	.55			
JouExst	.61				
ResRcgn		.77			
IntComm		.75			
ItlDevl		.74			
PrfProm		.68			
Citations		.66			
StiChll		.59			
BonPaym			.87		
LocComm				.93	
RspInvt					.97

[a] Extraction method: principal component analysis. Rotation method: Varimax with Kaiser normalization. Rotation converged in 6 iterations

[b] Only factorial loads >.5 are shown

[c] Appendix 4 summarizes the factorial analysis model, the variance accounted for by each variable, and correlations among variables

[d] Legend: see Table 1

Two multi-item factors were identified, and three variables remained separate as distinct, single-item factors: the desire to respond to a request or invitation from an institution, association or publisher; the desire to communicate the results to the local community; and the desire to increase the chances of receiving a bonus payment. These are the variables that were explained best, with extraction values of 98.6, 91.0 and 87.7 % respectively (see Appendix 4, Table 11).

Factor 1 was composed mainly of motivations related to linguistic and academic skills and competences associated with the linguistic proficiency and academic expertise needed to produce high-quality articles. It comprised the same items as factor 1 in the analysis of motivations to publish in English, with the exception of the desire for stimulating challenges.

Factor 2 focused on international communication, recognition and nonfinancial rewards. It brought together motivations that contributed separately to factors 2 and 3 in the analysis of motivations to publish in English (excluding financial reward, which resolved as a separate single-item factor). Consequently, factor 2 included intrinsic motivations related with the need for achievement through intellectual development and stimulating challenges on one hand, and extrinsic motivations related with the reward system of science on the other. Extrinsic motivations included some of the implicit and explicit rewards obtained by researchers as a result of publishing in Spanish journals, and thus subsumed the whole range of internalization processes (i.e. international communication, recognition and citations, and professional promotion).

Publication in Spanish-language journals as a consequence of researchers' self-assessment of the quality of their articles saturated both in factor 1 (professional expertise) and factor 2 (international communication, recognition and noneconomic rewards). This suggests that what respondents who publish in Spanish for this reason mean by 'quality' is, on one hand, externally attributed or recognized quality, which is related to the external benefits obtained for publishing in Spanish (factor 2), and on the other hand, self-perceived quality related to one's capacity and experience writing in this language, and with the more affect-related desire for the continued existence of scientific journals in this language (factor 1).

Differences between scientific domains

The main question this study set out to answer is whether researchers from different scientific domains, who are thus likely to have different value orientations, differed in their motivations for publishing research articles in English- or Spanish-medium scientific journals. In this section we use one-way ANOVA to examine variations in the motivational factors identified above across the four scientific domains. Table 8 shows the results of ANOVA with Bonferroni post hoc comparison, based on factor scores. The overall results of ANOVA showed significant variation in mean scores for all the motivating factors to publish in English across all four scientific domains.

Figures 3 and 4 compare plots of the motivational profiles of researchers in different domains. The mean scores for each factor are shown by domain, together with 95 % confidence intervals. Values that were within the confidence interval can be considered unlikely to be significantly different (with a probability of 95 %).

Turning to variations across domains in the factors that motivated researchers to publish in English, those factors that discriminated most clearly among scientific domains ($p < .001$) involved motivations related with international communication and recognition (F2), rewards (F3) and responding to invitations (F5). Professional expertise and accepting

Table 8 ANOVA of factors that motivated research article publication in English or Spanish

Motivating factors	ANOVA		Mean (standard deviation)				Bonferroni comparisons[a] Mean difference (I–J)					
	F statistic	*p* value	Natural and Exact Sciences (NE)	Technological Sciences (TS)	Social Sciences (SS)	Arts and Humanities (AH)	NE (I) TS (J)	NE (I) SS (J)	NE (I) AH (J)	TS (I) SS (J)	TS (I) AH (J)	SS (I) AH (J)
English												
F1: Professional expertise	4.2	.006**	−.06 (1.02)	.02 (.96)	.13 (.92)	.29 (1.03)	−.08	−.19	−.35*	−.11	−.27	−.16
F2: International communication and recognition	10.2	.000***	.11 (.91)	−.12 (.94)	−.33 (1.33)	−.05 (1.02)	.22*	.43***	.16	.21	−.07	−.28
F3: Rewards	10.7	.000***	−.04 (.99)	.15 (1.02)	.18 (.93)	−.50 (.96)	−.19	−.22	.47***	−.03	.65***	.69***
F4: Local communication	5.6	.001**	.03 (1.03)	.11 (.92)	−.16 (.95)	−.34 (.87)	−.07	.19	.37*	.27	.45**	−.18
F5: Invitations	7.1	.000***	−.05 (1.0)	.01 (.93)	.01 (1.09)	.49 (.93	−.07	−.06	−.54***	.00	−0.48**	−.48**
Spanish												
F1: Professional expertise	5.1	.002**	−.11 (.93)	−.04 (.98)	.08 (1.02)	.27 (1.15)	−.07	−.19	−.39**	−.11	−.31	−.20
F2: International communication, recognition, and noneconomic rewards	46.9	.000***	−.35 (.9)	−.14 (.92)	.35 (.98)	.62 (.92)	−.21	−.70***	−.97***	−.49***	−.76***	−.27
F3: Economic reward	9.8	.000***	−.12 (.86)	.03 (.91)	.29 (1.16)	−.19 (1.06)	−.15	−.41	.06	−.26	.21	.47***
F4: Local communication	.2	.880	.00 (1.09)	−.03 (.96)	−.02 (.92)	.06 (.90)	.33	.03	−.06	−.00	−.09	−.08
F5: Invitations	2.8	.041*	.00 (1.04)	−.08 (.98)	−.08 (.97)	.23 (.91)	.08	.08	−.23	.00	−.31	−.31*

[a] Significant differences: * $p < .05$; ** $p < .01$; *** $p < .001$

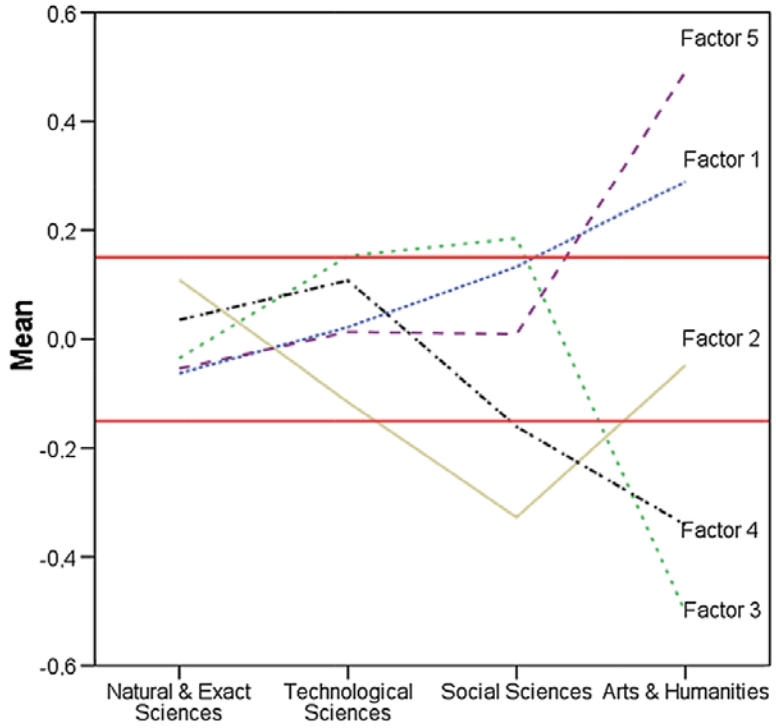


Fig. 3 Averages of factors that motivated publication in English, by scientific domain. Factors (see also Tables 6, 8): F1 Professional expertise; F2 International communication and recognition; F3 Rewards; F4 Local communication

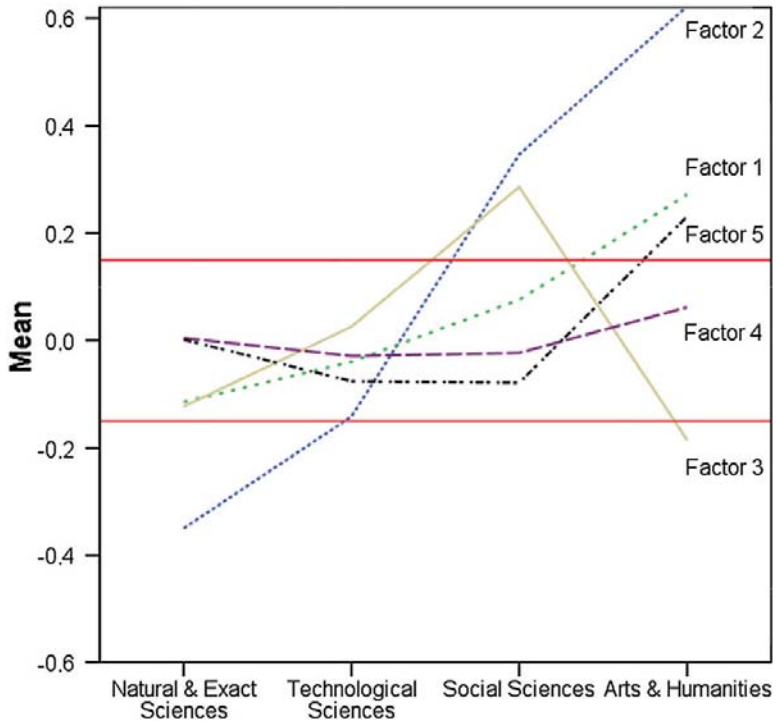


Fig. 4 Averages of factors that motivated publication in Spanish, by scientific domain. Factors (see also Tables 7, 8): F1 Professional expertise; F2 International communication, recognition, and noneconomic rewards; F3 Economic reward; F4 Local communication; F5 Invitations

invitations or requests (F1 and F5) were significantly more important for researchers in AH, whereas rewards and communicating research to the local scientific audience (F3 and F4) were significantly less important for these researchers. Secondly, international communication and recognition (F2) was significantly more important for researchers in NE, who differed from TS and SS researchers only in this factor. In contrast, NE researchers were driven more strongly by the international visibility and recognition provided by publication in English. NE researchers were clearly different from AH researchers (all factors except F2): the former were significantly more motivated by rewards and communication to the local audience (F3 and F4), and less motivated by their self-assessed professional competence and the desire to accept invitations or requests (F1 and F5). It should be noted that there were no significant differences between TS and SS researchers in any of the factors. But surprisingly, SS differed more clearly from AH (in both rewards and responding to invitations or commissions, F3 and F5) than from NE (in international communication and recognition only, F2).

In summary, our findings for motivations to publish in English showed that among NE researchers, the average values for all factors were within the confidence interval, so that none of these factors was significantly associated with belonging to this scientific domain, even though the strongest motivators were identified as international communication and recognition. The same was found for TS researchers. In contrast, SS researchers were characterized by their high level of motivation by rewards (F3), and their low level of motivation by recognition and international communication (F2) or local communication (F4, at the lower limit of the confidence interval). Finally, belonging to the AH domain was characterized by a strong association with factors 1, 3, 4 and 5: these researchers were more strongly motivated than average to write in English in response to invitations and requests (F5) and by motivations related with a high level of professional expertise (F1), and significantly less motivated to use English to seek rewards (F3) or to reach local audiences (F4).

Regarding motivations to publish in Spanish, our results showed significant variation in the mean scores for all motivating factors except factor 4 (local communication). The factors that best discriminated among scientific domains ($p < .001$) were those that involved motivations related with international communication and recognition (F2) and with rewards (F2 and F3). Factor 2 was significantly more important for AH and SS researchers, who were much more motivated than their TS and NE counterparts by recognition, international communication and noneconomic rewards as a result of publishing the results of their research in Spanish. It should be noted that NE and TS researchers did not differ in any factor. A final observation is that AH researchers differed from their SS colleagues in that the former were significantly more motivated by factor 2 and significantly less by factor 3. The importance of local communication (F4) did not differ among scientific domains. The strength of professional expertise (F1) as a motivator differed only between NE and AH researchers.

In summary, with regard to publication in Spanish, NE researchers were characterized by their low motivation to publish in this language in order to address an international audience or obtain recognition and noneconomic rewards (F2). This was also the least important factor for TS researchers (although once again their scores were at the lower limit of the confidence interval). In contrast, factor 2 was a strong motivation for SS and AH researchers. The latter were also characterized by being strongly motivated by professional expertise (F1) and invitations (F5) and significantly less motivated than average by the prospect of economic rewards (F3). SS researchers, on the other hand, were

characterized by being mainly motivated by factor 3 as well as by international communication, recognition and noneconomic rewards (F2).

As shown above, communication to the international scientific community and obtaining recognition were grouped in the same factor both in English (F2) and in Spanish (F2), which indicated that recognition of research work was identified by researchers as being linked to communication to the international scientific community regardless of the language used. We could hypothesize that these motivations will be linked to English in some scientific domains and to Spanish in others. In fact, factor 2 in the factor analysis of motivations to publish in English was linked mainly to the NE domain, which indicated that these researchers believed that the use of English to communicate to the international scientific community is related to obtaining recognition (significantly more than TS and SS, but surprisingly, not more than AH). In contrast, the use of Spanish was associated with the SS and AH domains, indicating the importance of Spanish in these scientific domains as the language used to communicate to the international community and obtain recognition.

Discussion

The goal of the research reported here was to examine the diversity of Spanish researchers' motivations for deciding to publish research articles in English or in Spanish, and how these vary across scientific domains according to the influence of the discipline-related scientific community to which they belong.

Our approach to this study assumed that academic writing features, communicative skills and discourse practices would vary across disciplines, and acknowledged a degree of correlation, as noted by Becher (1994: 153), between "the nature of knowledge domains and the nature of the associated disciplinary cultures". Earlier research, grounded on the seminal work by Granovetter (1973, 1985), who emphasized that individuals' behaviour is shaped and constrained by the social networks in which they are embedded, reported that the choice of language for academic publication is also shaped by this embeddedness, and is influenced by social and contextual features. In particular, researchers' behaviour may be influenced by their specific scientific domain (Hyland 2009; Swales and Leeder 2012), because scientific communities from different fields or disciplines may have distinct academic cultures with different values, attitudes and experiences (Swales 1998; Rey-Rocha et al. 1999; Petersen and Shaw 2002; Kuteeva and Airey 2013; Gnutzmann and Rabe 2014).

Different publication patterns across scientific domains

It is widely claimed that publication patterns are strongly related to scientific domain. The particular relevance of English as the "lingua franca" in scientific communication has been noted in research domains dealing with basic aspects of nature, which presumably are most likely to be of interest to an international readership. In contrast, languages other than English are considered more relevant in some more locally oriented disciplines that are more strongly influenced by an additional cultural dimension, particularly in the Social Sciences and Humanities (Swales 1990; Bordons and Gómez 2004; Ferguson 2007; Flowerdew and Li 2009; McGrath 2014; Burgess et al. 2014).

This claim, which has been made in previous studies (Petersen and Shaw 2002; Duszak and Lewkowicz 2008; Mauranen et al. 2010; Anderson 2013; McGrath 2014; Gnutzmann and Rabe 2014), is supported by the findings we obtained in a comparatively large sample, using a more systematic method of data collection and more rigorous analytical procedures. For the particular sample here studied, publishing research articles in English is most important for researchers in NE and TS, both in terms of the proportion of individuals who choose this language and the average number of papers they produce. Nevertheless, researchers in all domains expressed a similar degree of motivation when they write research articles in English. A focus on publication in Spanish was required to find differences between NE and TS researchers versus their SS and particularly their AH counterparts. One of the most notable findings of this study is that AH researchers expressed a similar degree of motivation when they write their manuscripts for publication in English- or Spanish-medium journals. However, in the light of our results, this motivation appears to reflect intention rather than actual practice, since AH researchers continue to publish their work mostly in their first language. In contrast, the motivations of NE and TS researchers do not play an important role in their decision to publish in Spanish, since few of them publish research articles in their L1. Moreover, they feel little motivation to do so.

Attitude toward English for publication purposes: willingness versus resignation

Our survey results show a generally favourable attitude towards the use of English for academic publication purposes, with patterns that were mostly consistent across different scientific domains. In addition, motivations to publish in English usually scored higher than motivations to publish in Spanish, whereas the patterns of motivations to publish in Spanish were generally characterized by lower and more heterogeneous scores. We are uncertain as to how this finding should be interpreted. Some authors associate this willingness to use English with resignation regarding the need to use EAL (Ferguson et al. 2011) whereas others point to a more willing acceptance of the use of EAL for publication purposes (Pérez-Llantada et al. 2011; Muresan and Pérez-Llantada 2014). In any case, it should be kept in mind that the loss of agency and control over the decision to publish in EAL or L1 might conflict with the significant degree of autonomy and decision-making freedom enjoyed by members of research communities we studied.

To appreciate the implications of our findings, it is important to recall that for the potential author, the choice of language is not only "one aspect of the complex process of research communication and identity construction" (Duszak and Lewkowicz 2008: 115) but is also a matter of policy, because the choice of language of publication is strongly related to institutionally-mandated measures of scientific productivity, visibility, impact and quality of the research. The preponderance of English in international academic communication is grounded, in part, on the policy of many national science and technology systems to reward English more than national-language publication, as the Spanish system does (Jiménez-Contreras et al. 2003; Rodríguez-Navarro 2009; Osuna et al. 2011; López Piñeiro and Hicks 2014). Another reason for the preponderance of English is the growing internationalization of teaching and research at universities and research centres (Preisler 2005; Pérez-Llantada et al. 2011; Kirkpatrick 2012). In consonance with these arguments, researchers in our sample, regardless the differences in publication patterns between scientific domains, use English rather than Spanish to obtain more intellectual feedback and broader international diffusion, as well as more citations, more recognition and better chances for professional promotion. This may reflect their internalization of assessment

systems that, as other authors have pointed out, generate specific adaptive and instrumental attitudes and practices (Preisler 2005; Dahler-Larsen 2011; Gotti 2012; López Piñeiro and Hicks 2014). It is worth stressing here that when research evaluation policies favour publication in mainstream journals and overemphasize the impact factor, the result may be researchers' loss of agency not only with regard to language but also in relation to their choice of research topics. This may, in turn, have the undesirable effect of narrowing research agendas by obliging researchers to work in areas more likely to interest "international" readers, to the detriment of research topics of greater relevance in the researchers' own country (Lillis and Curry 2010; López Piñeiro and Hicks 2014).

The patterns of motivation that influence the choice of language in the researchers we studied are consistent with previous research in very different regions that nonetheless share similarities in their research policies and national performance-based research funding systems (see Hicks 2012 for a review). As in Spain, these systems are highly influenced by a reliance on mainstream journal-based metrics and the so-called "publish or perish" assumption. Examples of these national contexts have been described thus far for China (Flowerdew and Li 2009), Hong Kong (Li and Flowerdew 2009), Poland (Duszak and Lewcowicz 2008), Germany (Gnutzmann and Rabe 2014) and Romania (Muresan and Pérez-Llantada 2014), and even in countries that have implemented linguistic policies to preserve local languages, e.g., Sweden (McGrath 2014) and Canada (Gentil and Séror 2014). Thus, the globalization not only of research communication, but of research assessment as well, can be considered a strong determinant of researchers' motivations that underlie their decision to publish in EAL or their L1 regardless of the geopolitical context.

Ideological and social reasoning behind the use of Spanish

However, there is also "evidence of cultural resistance in the textual strategies" (Gotti 2012: 61) and "negative attitudes towards this policy" (Flowerdew and Li 2009), particularly in the Humanities and Social Sciences. Researchers whom Preisler (2005) describes as 'the concerned' are believed to comprise "a small but influential minority whose views on the influence of English are more critical" (2005: 238). Their motivation may derive from "reaching a large audience through domestic publication" (Flowerdew and Li 2009: 13). Despite their motivation to publish in English in order to satisfy evaluation criteria, some researchers are concerned about the loss of scientific vocabulary and the deterioration of the national language code in some of its functional domains (such as higher education and scientific or scholarly research), the increasing marginalization of local issues, the diminishing dissemination of research findings in local contexts, and the decline of local journals (Preisler 2005; Duszak and Lewkowicz 2008; Pérez-Llantada et al. 2011; Li 2014; Bocanegra-Valle 2014).

In this connection, the opinions of the researchers we surveyed about their use of Spanish are somewhat diverse, albeit related mainly through ideological (defence of local issues, desire for the continued existence of scientific journals in Spanish, etc.) and social reasoning (responding to a commission or invitation from an institution, association or publisher). Thus far, arguments in support of publishing research in Spanish have been offered mainly within the context of the integrated regulation of behaviour,[5] and apparently aim to achieve a mixture of affective and social outcomes. Perhaps unsurprisingly, the motivations researchers report for choosing Spanish as the language of publication reflect

[5] 'Integrated regulation' is the most developmentally advanced form of extrinsic motivation. It involves regulations that are fully assimilated within the individual's other values, needs, and identities.

larger differences across domains. Firstly, differences in the motivations that were given high or low scores by researchers in each scientific domain reflected significant differences between AH and SS researchers compared to NE and TS researchers. These differences were clearest in most of the intrinsic motivations related to their self-assessed ability to write in Spanish and the intellectual challenge this entails, as well as in the emotional and social implications of choosing this language. With regard to extrinsic motivations, AH researchers once again stand out as scoring these items significantly more highly than the rest of the respondents. This domain-related difference is probably due to the traditionally intensive relationships between members of the Spanish AH science community and their counterparts in Latin American countries. Such relationships, based on the shared use of the Spanish language, generate an important source of returns and prestige for researchers in this scientific domain.

The functional split of languages

On the other hand, we found that extrinsic-individual motivations have a greater influence on decisions to publish in EAL rather than the researchers' L1. In other words, researchers, regardless of their scientific domain, are more likely to report external-individual motivations or reward motivations in connection with publication in English. In this regard, AH researchers stood out among the four domains compared here: their desire for increased rewards is a less influential drive for publishing in English than in the rest of the scientific domains. In addition, the importance of professional networks for AH researchers is reflected in the significantly higher scores they gave to the desire to respond to an invitation from an institution, association or publisher.

Despite these differences across scientific domains, a common dimension is apparent. For all researchers the choice between an international or local scientific audience is a major motivation that influences their decision to publish in an English- or Spanish-medium journal. Researchers' main motivations for choosing one language or the other have to do with their intention to adapt their message to the community they wish to address.

If we consider the desire to communicate with the international scientific community as a reflection of the main criterion used to evaluate research performance and excellence (and thus as a way to obtain recognition from the international scientific community), our results are consistent with the Mertonian view of science (Merton 1973). In this regard it is important to recall that according to Merton, researchers are motivated mainly by the recognition and prestige awarded by peers, and that other forms of extrinsic reward such as career advancement, salary increases and access to research funds may ensue from these main motivators. Therefore, in a utilitarian view of publication in English, researchers may opt for this language in order to obtain further rewards such as recognition and prestige. Publishing in English can lead to increased resources for further research as well as opportunities for promotion and career development.

Our results lend support to earlier findings in favour of the so-called "functional split of languages found elsewhere in the world in non-Anglophone settings" (Flowerdew and Li 2009: 14). Thus, despite being a common practice in non-Anglophone countries, several authors (Bordons and Gómez 2004; Preisler 2005; Flowerdew and Li 2009) agree that the use of a researcher's L1 for the local audience and English publication for the international readership represents an intermediate stance that does not penalize the use of either language. In this scenario, however, measures are needed to protect this fragile balance and avoid impoverishing knowledge production through the demise of local topics, the disappearance of local journals and the lack of outlets for knowledge dissemination in the L1,

among other factors. In this connection, Ferguson (2013) has noted the potential importance of language policy proposals for higher education, as implemented (for example) at the University of Oslo. This policy distinguishes four areas of language use—research, teaching, dissemination of research and administration—each with specific recommendations regarding the preferred language. Other proposals to overcome the burden faced by non-Anglophone researchers immersed in diglossic contexts are to urge Anglo-American journal editors and reviewers to show greater tolerance for the linguistic peculiarities of non-native writers (Ammon 2000), and to improve the quality standards of local journals (Wagner and Wong 2012; Salager-Meyer 2014). Finally, given the important role of research assessment policies, the potential of alternative measures (e.g. Altmetrics) to diminish the disproportionate influence of impact factor is worth investigating.

Limitations

Some caveats regarding the data and results of this study merit consideration. Our results and conclusions concern the particular sample we studied. Although they provide a new approach to the subject as well as relevant data, they should not be considered predictive, nor can they be generalized to the experiences of other researchers whose first language is not English. Attempts to understand the implications of our findings for researchers who work in other contexts and in other countries, including those whose L1 is Spanish, should be undertaken with due caution. Our results must be interpreted within the framework of the research context of Spanish public universities and research institutions, where academics are highly autonomous and enjoy considerable freedom in their research. Nor should our results be extrapolated to different organizational settings where researchers may need to adapt to existing structures, hierarchies and dynamics. Nevertheless, it is worth remembering that the autonomy enjoyed by Spanish researchers at public institutions may be conditioned by external elements related, for instance, with the evaluation and reward system imposed on these researchers by the increasingly widespread influence of evaluation agencies and research policies.

Implications

The choice of language used to communicate research results has become a matter of linguistic, policy and even economic concern. First, our study has implications for applied linguistics and pedagogy because it sheds some light on non-Anglophone researchers' perceived difficulties in writing research articles for publication in English-medium journals. These difficulties have led to increased calls for training in English for Academic Purposes, accredited language services and professional guidance during the writing process in order to ease the acquisition of specific rhetorical and stylistic features of research articles in English (Moreno et al. 2012; Muresan and Pérez-Llantada 2014; Li 2014). However, unless research institutions provide this type of training and editorial support for their researchers, the burden of English will remain a challenge for many research groups because of the limited economic resources at their disposal. Currently in Spain, very few universities and research institutions provide such services for free, so research groups are left to face the cost of external editorial assistance essentially as an additional out-of-pocket expense. This situation may increase inequities in publishing opportunities between large, well-funded groups and small, under-funded groups. Training and editorial services provided by institutions may help not only to reduce the centre-periphery gap (Salager-Meyer 2008) but also to avoid the unfair burden on small groups with limited economic

resources—a limitation not necessarily related with the quality of their research. Finally, it should be remembered that discipline-specific needs are a key factor to consider in designing effective pedagogical resources and editorial assistance (Dudley-Evans and St John 1998: 51). Moreover, researchers' motivations to publish in EAL or in their L1 are related not only with their proficiency in English for Academic Purposes but also with their knowledge of the rhetorical and discourse conventions that characterize their particular academic discipline.

Secondly, our findings have implications for science policy since the choice of language is also related to scientific productivity and visibility, the quality and impact of research, and research assessment policies. These implications are particularly evident in current debates about research assessment criteria. As Kuteeva and Mauranen (2014: 3) state, "the field of assessment and ranking has rapidly found itself amidst heavy turbulence, which may give the linguistic issues a good shake-up along the way". The future of non-Anglophone languages in academic fields will largely depend on how this debate is settled by policy makers and the scientific community. Prolonged efforts to defend the current research evaluation system may contribute to the persistence of what Tardy (2004: 249) described as a "self-perpetuating cycle in which English becomes increasingly important" as the language of science, at the expense of national languages. But if non-English-speaking countries make changes in their research assessment policies to give greater prominence to knowledge communication in national languages or to increase the rewards for research on local topics, English and national languages for academic purposes may come to coexist in a fairer, more balanced fashion. In fact, as pointed out by Uzuner (2008: 251), the "limited participation of multilingual scholars in global scholarship will impoverish knowledge production". Thus, promoting multilingualism is a way to favour the existence of different scientific contents, different ways of reporting science, and ultimately a more pluralistic body of science that better reflects the (desirable) heterogeneity of schools of thought, methodologies and analytical approaches. To achieve this aim, some biliterate and multiliterate environments (such as the Nordic countries and Canada) have designed linguistic policies that pursue parallel language use in academic fields (McGrath 2014; Gentil and Séror 2014). However, these efforts have not been as effective as hoped, precisely because of the influence of current research assessment and reward systems. Researchers in this bipolar policy context receive contradictory messages. On the one hand, some linguistic policies favour the parallel use of English along with the national language, and encourage researchers to use their mother tongue to communicate their results. On the other hand, the evaluation criteria used to assess research perpetuate "the performative pressure from journal ranking lists" (Li 2014: 45). This pressure often leads researchers to make the pragmatic decision to publish their results in international indexed journals so as not to jeopardize their professional career. In light of this situation, achieving a truly multilingual academy will require, in the first place, a global solution to the research assessment debate. An additional way to support multilingualism in the academy would be a common linguistic policy in the European Union aimed at achieving global consensus on the importance of preserving national languages as legitimate media for science research communication.

Future research

As we hypothesized in the introduction, what influences researchers' motivations and their motivational dynamics is the conjunction of their attitudes, beliefs and habits, together with the rules, social uses, communication standards, customs, practices and roles of the research community within their scientific domain. Further research will be needed to

improve our understanding of these scientific communities and the elements that are likely to influence their members' publication habits, patterns and motivations. Some of these elements, considered here in our survey and in previous reports, are seniority, gender, publication experience (López-Navarro et al. 2015), the perceived difficulty of writing different sections of research articles, and L1 researchers' level of proficiency in the use of English for academic purposes (Moreno et al. 2012). Other elements that remain unexplored and should be investigated include (but are not limited to) (a) the use of local languages in scientific dissemination activities, (b) the relationship between choosing EAL for publication purposes and national or international collaboration, (c) attitudes and motivations for using EAL and L1 in the Latin American research context (uncharted territory on this topic), and (d) interactions between different research assessment policies and publication practices.

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Appendix 1: formulation of the position index (PI)

The PI is formulated as follows (Silva 1997; author's translation into English):

Let Pi be the proportion of individuals who choose the category i of the scale (in our case i can take integer values between 1 and 5). The weighted score M is calculated as follows:

$$M = \sum_{i=1}^{k} iP_i$$

Accordingly, PI is defined as follows:

$$\mathrm{PI} = \frac{M - 1}{k - 1}$$

Appendix 2: PROXSCAL procedure for calculating distances among scientific domains

PROXSCAL (proximity scaling) uses multidimensional scaling to find the structure in a set of proximity measures between objects such that the distances between points in the space match the given (dis)similarities as closely as possible (Meulman and Heiser 2010).

Distances are calculated as follows: given the table of averages for the variables (in our case, the ratings of different motivations for publishing in English and Spanish), in each of the groups (in our case each of the domains and languages), a distance matrix was constructed such that cell ij corresponds to the distance between the averages of groups ij.

Starting with a table such as the one below (see, for example, Table 5).

	Natural and Exact Sciences (NE)	Technological Sciences (TS)	Social Sciences (SS)	Arts and Humanities (AH)
Item 1	Average NE_1	Average TS_1	Average SS_1	Average AH_1
Item 2	Average NE_2	Average TS_2	Average SS_2	Average AH_2
Item n	Average NEn	Average TSn	Average SSn	Average AHn

we converted the information to a matrix with the following structure:

	NE	TS	SS	AH
NE		X_1	Y_1	Z_1
TS	X_2		Y_2	Z_2
SS	X_3	Y_3		Z_3
AH	X_4	Y_4	Z_4	

where each of the values from X_1 to Z_4 are the Euclidean distances, calculated as follows for each domain in each language:

$$\mathrm{X}_1 = \Big[(\text{Average NE}_1 - \text{Average TS}_1)^2 + (\text{Average NE}_2 - \text{Average TS}_2)^2 + \ldots + (\text{Average NE}_n - \text{Average TS}_n)^2\Big]^{1/2}$$

To make distances between English and Spanish comparable, averages were homogenized through ranks, due to the differences in size among the subsamples (i.e. the number of informants who reported having published in English and in Spanish, and who were therefore asked to assess their motivations for publishing in one language or another). This made it possible to represent assessments of the motivations for publishing in either language in the same plane in a PROXSCAL graph.

Appendix 3: procedure for the allocation of respondents to a specific scientific domain

The procedure is based on the following assumptions: (a) Researchers belonging to a specific domain have a profile determined by the presence or absence of particular UNESCO codes; (b) Researchers working simultaneously in two scientific areas do not necessarily work 50 % in each; instead they work mainly to a single domain. To resolve draws (i.e. respondents belonging to more than one domain), we developed a model based on the UNESCO codes to predict which domain each researcher belongs to. We started with those who selected UNESCO codes in both Natural and Exact Sciences and in Technological Sciences. Taking into consideration the different UNESCO codes selected by individuals in NE only or in TS only, we developed a model to predict the domain that best fit each respondent's profile. A logistic regression model was used to estimate the coefficients of the model, using only sample units that belonged to a single domain.

Table 9 Classification table[a]

Observed Step 1	Predicted		
	Domain: Natural and Exact Sciences		
	0	1	% correct
Domain: Natural and Exact Sciences			
0	111	0	100.0
1	4	780	99.5
Global percentage			99.6

[a] The cut-off value was .500

$$P(Y = \text{Domain1}/\text{Unesco}_{11}\ldots\text{Unesco}_{99}) = {1}\Big/{1 + e^{-(\sum b_i * \text{Unesco}_i)}}$$

To estimate the parameters and evaluate the predictive model we used only the sample with no draws and then applied this model to the rest of the sample (i.e. researchers with codes belonging to more than one domain). We used only UNESCO codes with $\sigma > 0$. To resolve the logical problems of multiple correlations between the codes, the data matrix was reduced by factor analysis without rotation, as this technique ensures orthogonality of the factors. The predictive capacity of this model is shown in Table 9. The model correctly classified 99.6 % of cases, thus showing optimal predictive capacity.

Appendix 4: factorial analyses: model summary

See Tables 10, 11, 12, 13 and 14.

Table 10 Total variance explained

Component[a]	English				Spanish			
	Initial eigenvalues			Extraction Sums of squared loadings	Initial eigenvalues			Extraction Sums of squared loadings
	Total	% of variance	Cumulative %	Total	Total	% of variance	Cumulative %	Total
1	4.7	33.4	33.4	4.7	6.8	48.7	48.7	6.8
2	1.6	11.6	45.0	1.6	1.1	7.8	56.5	1.1
3	1.2	8.9	53.9	1.2	1.0	7.4	63.9	1.0
4	.97	6.9	60.9	.97	.88	6.3	70.1	.88
5	.82	5.8	66.7	.82	.69	4.9	75.1	.69
6	.75	5.3	72.1		.54	3.9	78.9	
7	.70	5.0	77.1		.52	3.7	82.6	
8	.58	4.1	81.2		.43	3.0	85.7	
9	.56	4.0	85.2		.41	2.9	88.6	
10	.51	3.6	88.8		.39	2.8	91.4	
11	.45	3.2	92.0		.35	2.5	93.9	
12	.43	3.1	95.1		.30	2.1	96.1	
13	.38	2.7	97.9		.28	2.0	98.1	
14	.30	2.1	100.0		.27	1.9	100.0	

[a] Extraction method: principal component analysis

Table 11 Communalities

Motivations[a]	Initial	Extraction[b]	
		English	Spanish
IntComm	1	.73	.70
LocComm	1	.91	.91
Citations	1	.61	.70
ItlDevl	1	.45	.70
PrfProm	1	.74	.75
BonPaym	1	.64	.88
ResRcgn	1	.63	.75
RspInvt	1	.84	.99
StiChll	1	.54	.63
JouExst	1	.59	.62
WrtAbil	1	.71	.73
ArtQual	1	.56	.69
PubExpr	1	.67	.72
WrtImpr	1	.72	.75

[a] Legend: see Table 1

[b] Extraction method: principal component analysis. The extraction of a variable indicates the proportion of variance accounted for by each factor extracted

Table 12 Kaiser–Meyer–Olkin and Bartlett's test

	English	Spanish
Kaiser–Meyer–Olkin measure of sampling adequacy[a]	.87	.94
Bartlett's test of sphericity[b]		
Approx. chi squared	5285.1	6081.8
df.	91	91
Sig.	.000	.000

[a] The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy tests whether partial correlations between variables are sufficiently small. The KMO statistic ranges from 0 to 1. It measures sampling adequacy, which should be >.5 for a satisfactory factor analysis

[b] Bartlett's test of sphericity tests the null hypothesis that the correlation matrix is an identity matrix. Here, the test shows that in both cases (English and Spanish) there were significant correlations between variables, so the factor model is informative

Table 13 Correlation matrix for motivations to publish in English[a,b]

Motivations[c]	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. IntComm	1													
2. LocComm	.17	1												
3. Citations	.26	.13	1											
4. ItlDevl	.25	.20	.38	1										
5. PrfProm	.03#	.09*	.45	.28	1									
6. BonPaym	−.06**	.12	.24	.16	.38	1								
7. ResRcgn	.39	.11	.38	.28	.36	.16	1							
8. RspInvt	.13	.16	.24	.29	.19	.26	.26	1						
9. StiChll	.17	.16	.20	.43	.23	.24	.24	.36	1					
10. JouExst	.09*	.25	.20	.33	.17	.27	.17	.35	.37	1				
11.WrtAbil	.12	.18	.20	.36	.19	.23	.18	.32	.47	.56	1			
12. ArtQual	.20	.12	.19	.32	.20	.19	.28	.21	.41	.31	.43	1		
13. PubExpr	.16	.18	.21	.32	.19	.19	.18	.29	.40	.50	.59	.48	1	
14. WrtImpr	.09	.18	.18	.38	.19	.21	.15	.29	.49	.52	.69	.42	.61	1

[a] Sig. (unilateral): all correlations are significant at the .001 level, except * (.01) ** (.05) and # (Not significant)

[b] Determinant = .015. Determinants close to zero indicate that the variables are linearly related, which means that factor analysis is a relevant technique to analyse these variables

[c] Legend: see Table 1

Table 14 Correlation matrix for motivations to publish in Spanish[a,b]

Motivations[c]	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. IntComm	1													
2. LocComm	.18	1												
3. Citations	.58	.24	1											
4. ItlDevl	.57	.32	.64	1										
5. PrfProm	.54	.26	.66	.60	1									
6. BonPaym	.36	.15	.51	.42	.54	1								
7. ResRcgn	.56	.39	.56	.61	.66	.38	1							
8. RspInvt	.15	.20	.22	.23	.22	.21	.24	1						
9. StiChll	.54	.29	.48	.61	.55	.44	.61	.26	1					
10. JouExst	.37	.38	.37	.42	.34	.27	.40	.22	.47	1				
11. WrtAbil	.47	.28	.43	.47	.43	.34	.41	.17	.50	.48	1			
12. ArtQual	.56	.23	.50	.57	.52	.39	.57	.20	.60	.49	.58	1		
13. PubExpr	.49	.28	.50	.50	.49	.41	.50	.20	.54	.48	.64	.63	1	
14. WrtImpr	.48	.21	.47	.46	.47	.43	.42	.23	.55	.46	.64	.55	.66	1

[a] Sig. (unilateral): all correlations are significant at the .001 level

[b] Determinant = .001

[c] Legend: see Table 1

References

Amabile, T. M., Hill, K. G., Hennessey, B. A., & Tighe, E. M. (1994). The work preference inventory: Assessing intrinsic and extrinsic motivational orientations. *Journal of Personality and Social Psychology, 66*(5), 750–967.

Ammon, U. (2000). Towards more fairness in international English: Linguistic rights of non-native speakers? In R. Phillipson (Ed.), *Rights to language, equity and power in education* (pp. 111–116). New Jersey: Lawrence Erlbaum.

Ammon, U. (2001). Editor's preface. In U. Ammon (Ed.), *The dominance of English as a language of science* (pp. v–x). Berlin, New York: Mouton de Gruyter.

Ammon, U. (2003). The international standing of the German language. In J. Maurais & M. Morris (Eds.), *Languages in a globalising world* (pp. 231–249). Cambridge: Cambridge University Press.

Anderson, L. (2013). Publishing strategies of young, highly mobile academics: The question of language in the European context. *Language Policy, 12*, 273–288.

Becher, T. (1994). The significance of disciplinary differences. *Studies in Higher Education, 19*, 151–161.

Benfield, J. R., & Feak, C. B. (2006). How authors can cope with the burden of English as an international language. *CHEST Journal, 129*(6), 1728–1730.

Bennett, K. (2010). Academic writing practices in Portugal: Survey of humanities and social science researchers. *Diacrítica, 24*(1), 193–209.

Bocanegra-Valle, A. (2014). 'English is my default academic language': Voices from LSP scholars publishing in a multilingual journal. *Journal of English for Academic Purposes, 13*, 65–77.

Bolton, K., & Kuteeva, M. (2012). English as an academic language at a Swedish university: Parallel language use and the 'threat' of English. *Journal of Multilingual and Multicultural Development, 33*(5), 429–447.

Bordons, M., & Gómez, I. (2004). Towards a single language in science? A Spanish view. *Serials, 17*(2), 189–195.

Burgess, S. (2014). Centre-periphery relations in the Spanish context: temporal and cross-disciplinary variation. In K. Bennett (Ed.), *The semiperiphery of academic writing. Discourses, communities and practices* (pp. 93–104). London: Palgrave Macmillan.

Burgess, S., Gea-Valor, M. L., Moreno, A. I., & Rey-Rocha, J. (2014). Affordances and constraints on research publication: A comparative study of the language choices of Spanish historians and psychologists. *Journal of English for Academic Purposes, 14*, 72–83.

Canagarajah, S. (1996). "Nondiscursive" requirements in academic publishing, material resources of periphery scholars, and the politics of knowledge production. *Written Communication, 13*, 435–472.

Canagarajah, S. (2002). *A geopolitics of academic writing*. Pittsburgh: University of Pittsburgh Press.

Carayol, N., & Matt, M. (2004). Does research organization influence academic production? Laboratory level evidence from a large European university. *Research Policy, 33*(8), 1081–1102.

Coates, R., Sturgeon, B., Bohannan, J., & Pasini, E. (2002). Language and publication in cardiovascular research articles. *Cardiovascular Research, 53*, 279–285.

Cohen, S. G., & Bailey, D. E. (1997). What makes teams work: Group effectiveness research from the shop floor to the executive suite. *Journal of Management, 23*(3), 239–290.

Connor, U. (1996). *Contrastive rhetoric*. Cambridge: Cambridge University Press.

Curry, M., & Lillis, T. (2004). Multilingual scholars and the imperative to publish in English: Negotiating interests, demands and rewards. *TESOL Quarterly, 38*, 663–688.

Dahler-Larsen, P. (2011). *The evaluation society*. Palo Alto, CA: Stanford University Press.

Davies, R. J. (2003). Written discourse across cultures I: Towards an integrated approach to EL2 composition pedagogy. Accessed December 22, 2014, from http://www.ed.ehime-u.ac.jp/~kiyou/0402/pdf36-2/5.pdf

De Swaan, A. (2001). *Words of the world: The global language system*. Cambridge: Wiley, Polity Press.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behaviour*. New York: Plenum.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination behaviour. *Psychological Inquiry, 11*(4), 227–268.

Deci, E. L., & Ryan, R. M. (2002). Self-determination research: reflections and future directions. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination research* (pp. 431–441). Rochester: University of Rochester Press.

Dudley-Evans, T., & St John, M. J. (1998). *Developments in English for specific purposes: A multi-disciplinary approach*. Cambridge: Cambridge University Press.

Dundar, H., & Lewis, D. R. (1998). Determinants of research productivity in higher education. *Research in Higher Education, 39*(6), 607–631.

Duszak, A., & Lewkowicz, J. (2008). Publishing academic texts in English: A polish perspective. *Journal of English for Academic Purposes, 7*, 108–120.
ElMalik, A. T., & Nesi, H. (2008). Publishing research in a second language: The case of Sudanese contributors to international medical journals. *Journal of English for Academic Purposes, 7*, 87–96.
European Commission. (2003). Third European Report on SCT indicators. Accessed December 22, 2014, from http://www.eurosfaire.prd.fr/7pc/doc/1124294203_third_european_report_on_science_technology_indicators_2003.pdf
Fagan, A., & Burgess, S. (2002). (Kid) Gloves on or off? Academic conflict in research articles across the disciplines. *Revista Canaria de Estudios Ingleses, 44*, 79–96.
Ferguson, G. (2007). The global spread of English, scientific communication and ESP: Questions of equity, access and domain loss. *Ibérica, 13*, 7–38.
Ferguson, G. (2013). English, development and education: Charting the tensions. In E. J. Erling & P. Seargeant (Eds.), *English and development: Policy, pedagogy and globalization* (pp. 25–46). Bristol: Multilingual Matters.
Ferguson, G., Pérez-Llantada, C., & Plo, R. (2011). English as an international language of scientific publication: A study of attitudes. *World Englishes, 30*(1), 41–59.
Flowerdew, J. (1999). Writing for scholarly publication in English: The case of Hong Kong. *Journal of Second Language Writing, 8*(2), 123–145.
Flowerdew, J. (2001). Attitudes of journal editors to non-native speaker contributions. *Tesol Quarterly, 35*(1), 121–150.
Flowerdew, J. (2008). Scholarly writers who use English as an Additional Language: What can Goffman's ''Stigma'' tell us? *Journal of English for Academic Purposes, 7*, 77–86.
Flowerdew, J. (2013). English for research publication purposes. In B. Paltridge & S. Starfield (Eds.), *The handbook of English for specific purposes* (pp. 301–322). Chichester: Wiley.
Flowerdew, J., & Li, Y. (2009). English or Chinese? The trade-off between local and international publication among Chinese academics in the humanities and social sciences. *Journal of Second Language Writing, 18*, 1–6.
Frame, J. D., & Carpenter, M. P. (1979). International research collaboration. *Social Studies of Science, 9*(4), 481–497.
Gagné, M., & Deci, E. L. (2005). Self-determination theory and work motivation. *Journal of Organizational Behavior, 26*(4), 331–362.
Gentil, G., & Séror, J. (2014). Canada has two official languages-or does it? Case studies of Canadian scholars' language choices and practices in disseminating knowledge. *Journal of English for Academic Purposes, 13*, 17–30.
Giannoni, D. S. (2008). Medical writing at the periphery: The case of Italian journal editorials. *Journal of English for Academic Purposes, 7*, 97–107.
Gibbs, W. W. (1995). Lost science in the third world. *Scientific American, 273*(2), 76–83.
Gnutzmann, C., & Rabe, F. (2014). 'Theoretical subtleties' or 'text modules'? German researchers' language demands and attitudes across disciplinary cultures. *Journal of English for Academic Purposes, 13*, 31–40.
Gotti, M. (2012). Cross-cultural aspects of academic discourse. *Brno Studies in English, 38*(2), 59–78.
Gotti, M., Heller, D., & Dossena, M. (2002). *Conflict and negotiation in specialized texts*. Bern: Peter Lang.
Granovetter, M. (1973). The strength of weak ties. *American Journal of Sociology, 78*(6), 1360–1380.
Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology, 91*(3), 481–510.
Hamel, R. E. (2007). The dominance of English in the international scientific periodical literature and the future of language use in science. *AILA Review, 20*(1), 53–71.
Hanauer, D. I., & Englander, K. (2011). Quantifying the burden of writing research articles in a second language: Data from Mexican scientists. *Written Communication, 28*(4), 403–416.
Hicks, D. (2012). Performance-based university research funding systems. *Research Policy, 41*, 251–261.
Huang, W. L., Feeney, M. K., & Welch, E. W. (2011). Organizational and individual determinants of patent production of academic scientists and engineers in the United States. *Science and Public Policy, 38*(6), 463–479.
Hyland, K. (2009). *Academic discourse: English in a global context*. London: Continuum International Publishing Group.
Hyland, K. (2013). Writing in the university: Education, knowledge and reputation. *Language Teaching, 46*(1), 53–70.
Hyland, K., & Bondi, M. (2006). *Academic discourse across disciplines*. Bern: Peter Lang.
Jiménez-Contreras, E., De Moya, F., & Delgado, E. (2003). The evolution of research activity in Spain: The impact of the National Commission for the Evaluation of Research Activity (CNEAI). *Research Policy, 32*, 123–142.

Kirkpatrick, A. (2012). English in higher education in the postcolonial world. In C. A. Chapelle (Ed.), *The encyclopedia of applied linguistics*. Blackwell: Blackwell Publishing Ltd.

Kronegger, L., Ferligoj, A., & Doreian, P. (2011). On the dynamics of national scientific systems. *Quality & Quantity, 45*(5), 989–1015.

Kuteeva, M., & Airey, J. (2013). Disciplinary differences in the use of English in higher education: Reflections on recent language policy developments. *Higher Education, 67*(5), 533–549.

Kuteeva, M., & Mauranen, A. (2014). Writing for publication in multilingual contexts: An introduction to the special issue. *Journal of English for Academic Purposes, 13*, 1–4.

Lam, A. (2011). What motivates academic scientists to engage in research commercialization: 'Gold', 'ribbon' or 'puzzle'? *Research Policy, 40*, 1354–1368.

Li, Y. (2014). Seeking entry to the North American market: Chinese management academics publishing internationally. *Journal of English for Academic Purposes, 13*, 41–52.

Li, Y., & Flowerdew, J. (2007). Shaping Chinese novice scientists' manuscripts for publication. *Journal of Second Language Writing, 16*, 100–117.

Li, Y., & Flowerdew, J. (2009). International engagement versus local commitment: Hong Kong academics in the humanities and social sciences writing for publication. *Journal of English for Academic Purposes, 8*, 279–293.

Lillis, T., & Curry, M. J. (2010). *Academic writing in a global context: The politics and practices of publishing in English*. London: Routledge.

Long, J. S., & McGinnis, R. (1981). Organizational context and scientific productivity. *American Sociological Review, 46*(4), 422–442.

López Piñeiro, C., & Hicks, D. (2014). Reception of Spanish sociology by domestic and foreign audiences differs and has consequences for evaluation. *Research Evaluation* (in press).

López-Navarro, I., Moreno, A. I., Burgess, S., Sachdev, I., & Rey-Rocha, J. (2015). Why publish in English versus Spanish? Towards a framework for the study of researchers' motivations. *Revista Española de Documentación Científica, 38*(1), e073.

Maci, S. M. (2012). The discussion section of medical research articles: A cross-cultural perspective. In M. Gotti (Ed.), *Academic identity traits: A corpus-based investigation* (pp. 95–120). Bern: Peter Lang.

Man, J. P., Weinkauf, J. G., Tsang, M., & Sin, D. D. (2004). Why do some countries publish more than others? An international comparison of research funding, English proficiency and publication output in highly ranked general medical journals. *European Journal of Epidemiology, 19*, 811–817.

Martín-Sempere, M. J., Garzón-García, B., & Rey-Rocha, J. (2008). Scientists' motivation to communicate science and technology to the public: Surveying participants at the Madrid science fair. *Public Understanding of Science, 17*(3), 349–367.

Mauranen, A., Hynninen, N., & Ranta, E. (2010). English as an academic lingua franca: The ELFA project. *English for Specific Purposes, 29*, 183–190.

McCarty, J. A., & Hattwick, P. M. (1992). Cultural value orientations: A comparison of magazine advertisements from the United States and Mexico. In J. F. Sherry, Jr., & B. Sternthal (Eds.) *N A—advances in consumer research* (Vol. 19, pp. 34–38.). Provo, UT: Association for Consumer Research.

McGrath, L. (2014). Parallel language use in academic and outreach publication: A case study of policy and practice. *Journal of English for Academic Purposes, 13*, 5–16.

Merton, R. K. (1973). *The sociology of science*. Chicago: The University of Chicago Press.

Meulman, J. J., & Heiser, W. (2010). *IBM SPSS Categories 19*. SPSS Inc. Accessed December 22, 2014, from http://public.dhe.ibm.com/software/analytics/spss/support/Stats/Docs/19.0/Client/User_Manuals/English/IBM_SPSS_Categories_19.pdf

Moreno, A. I. (2008). The importance of comparing comparable corpora in cross-cultural studies. In U. Connor, E. Nagelhout, & W. Rozycki (Eds.), *Contrastive rhetoric: Reaching to intercultural rhetoric* (pp. 25–41). Amsterdam: John Benjamins.

Moreno, A. I. (2011). English for research publication purposes and crosscultural academic discourse analysis. In M. Borham Puyal, M. J. Fernández Gil, S. Bautista Martín, B. García Riaza, J. Ruano García, M. J. Díez García, & P. Álvarez Mosquera (Eds.), *Current trends in anglophone studies: Cultural, linguistic and literary research* (pp. 53–69). Salamanca: Ediciones Universidad de Salamanca.

Moreno, A. I., Burgess, S., Sachdev, I., López-Navarro, I., & Rey-Rocha, J. (2013). *The ENEIDA questionnaire: publication experiences in scientific journals in English and Spanish*. Accessed December 22, 2014, from http://eneida.unileon.es/eneidaquestionnaire.php

Moreno, A. I., Rey-Rocha, J., Burgess, S., López-Navarro, I., & Sachdev, I. (2012). Spanish researchers' perceived difficulty writing research articles for English-medium journals: The impact of proficiency in English versus publication experience. *Ibérica, 24*, 157–183.

Muresan, L. M., & Pérez-Llantada, C. (2014). English for research publication and dissemination in bi-/multiliterate environments: The case of Romanian academics. *Journal of English for Academic Purposes, 13*, 53–64.
Osuna, C., Cruz-Castro, L., & Sanz-Menéndez, L. (2011). Overturning some assumptions about the effects of evaluation systems on publication performance. *Scientometrics, 86*, 575–592.
Pérez-Llantada, C., Plo, R., & Ferguson, G. R. (2011). "You don't say what you know, only what you can": The perceptions and practices of senior Spanish academics regarding research dissemination in English. *English for Specific Purposes, 30*(1), 18–30.
Petersen, M., & Shaw, P. (2002). Language and disciplinary differences in a biliterate context. *World Englishes, 21*(3), 357–374.
Preisler, B. (2005). Deconstructing 'the domain of science' as a sociolinguistic entity in EFL societies: The relationship between English and Danish in higher education and research. In B. Preisler, A. Fabricius, H. Haberland, S. Kjaebeck, & K. Risager (Eds.), *The consequences of mobility: Linguistic and sociocultural contact zones* (pp. 238–248). Roskilde: Roskilde University.
Rey-Rocha, J., Garzón-García, B., & Martín-Sempere, M. J. (2006). Scientists' performance and consolidation of research teams in Biology and Biomedicine at the Spanish Council for Scientific Research. *Scientometrics, 69*(2), 183–212.
Rey-Rocha, J., Martín Sempere, M. J., López-Vera, F., & Martínez Frías, J. (1999). English versus Spanish in science evaluation. *Nature, 397*, 14.
Rey-Rocha, J., & Martín-Sempere, M. J. (1999). The role of domestic journals in geographically-oriented disciplines: The case of Spanish journals on earth sciences. *Scientometrics, 45*(2), 203–216.
Rodríguez-Navarro, A. (2009). Sound research, unimportant discoveries: Research, universities, and formal evaluation of research in Spain. *Journal of the American Society for Information Science and Technology, 60*(9), 1845–1858.
Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*, 68–78.
Salager-Meyer, F. (2008). Scientific publishing in developing countries: Challenges for the future. *Journal of English for Academic Purposes, 7*, 121–132.
Salager-Meyer, F. (2014). Writing and publishing in peripheral scholarly journals: How to enhance the global influence of multilingual scholars? *Journal of English for Academic Purposes, 13*, 78–82.
Sanz, E., Aragón, I., & Méndez, A. (1995). The function of national journals in disseminating applied science. *Journal of Information Science, 21*(4), 319–323.
Silva, L. C. (1997). *Cultura estadística e investigación científica en el campo de la salud: Una mirada crítica*. Madrid: Díaz de Santos.
Smeby, J. C., & Try, S. (2005). Departmental contexts and faculty research activity in Norway. *Research in Higher Education, 46*(6), 593–619.
Smith, K. G., Smith, K. A., Olian, J. D., Sims, H. P, Jr, O'Bannon, D. P., & Scully, J. A. (1994). Top management team demography and process: The role of social integration and communication. *Administrative Science Quarterly, 39*(3), 412–438.
Swales, J. (1990). *Genre analysis: English in academic and research settings*. Cambridge: Cambridge University Press.
Swales, J. (1998). *Other floors: Other voices. A textography of a small university building*. Mahwah: Lawrence Erlbaum Associates.
Swales, J. (2004). *Research genres: Explorations and applications*. Cambridge: Cambridge University Press.
Swales, J., & Leeder, C. (2012). A reception study of the articles published in English for specific purposes from 1990–1999. *English for Specific Purposes, 31*(2), 137–146.
Tardy, C. (2004). The role of English in scientific communication: Lingua franca or Tyrannosaurus rex? *Journal of English for Academic Purposes, 3*, 247–269.
UNESCO (1988) Proposed international standard nomenclature for fields of science and technology. Accessed December 22, 2014, from http://unesdoc.unesco.org/images/0008/000829/082946eb.pdf
Uzuner, S. (2008). Multilingual scholars' participation in core/global academic communities: A literature review. *Journal of English for Academic Purposes, 7*, 250–263.
Van Raan, A. F. J. (1997). Science as an international enterprise. *Science and Public Policy, 24*(5), 290–300.
Vázquez, I., & Giner, D. (2008). Beyond mood and modality: Epistemic modality markers as hedges in research articles. A cross-disciplinary study. *Revista Alicantina de Estudios Ingleses, 21*, 171–190.
Wagner, C. S., & Wong, S. K. (2012). Unseen science? Representation of BRICs in global science. *Scientometrics, 90*(3), 1001–1013.
Wood, A. (2001). International scientific English: The language of research scientist around the world. In M. Peacock & J. Flowerdew (Eds.), *Research perspectives on English for academic purposes* (pp. 71–83). Cambridge: Cambridge Applied Linguistics.