

LinkedIn use by academics: an indicator for science policy and research?

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This paper is a work in progress and incomplete.

Abstract

The increasing importance of social media metrics, such as altmetrics, in evaluating the social impact of research and as a source of data for scholarly research has raised concerns about their representativeness with respect to the academic community. This paper addresses this issue by investigating the adoption of LinkedIn among a representative sample of over 12,000 UK academics, using both Scopus publication data and LinkedIn data. The paper offers two main contributions. Firstly, it identifies the types of researchers visible on LinkedIn, providing valuable insights into the profiles of academics who use this platform. Secondly, it enhances our understanding of the usefulness of LinkedIn as a data source and measure for science and innovation studies. Overall, this paper provides significant insights into the use of LinkedIn by academics and its potential as a data source for research evaluation and scholarly studies.

1. Introduction

The amassed presence of social networking services (SNS) has widely permeated academic life and scientific professions are not exempted of the changes occurring as a result of the increasing use of digital means to communicate, interact and connect. Despite the increasing literature analysing disciplinary differences on the adoption and use of SNS by researchers, most studies investigating the use of SNS by academics have focused on platforms set for ad hoc purposes (eg. Mendeley, Academia, Research Gate, Google Scholar), studies on professional networking platforms in academia are rare. This study expands the current understanding of SNS in academic contexts by looking at LinkedIn. In doing so, this paper is set to understanding the nature of new metrics and impact indicators.

The use of SNS for professional purposes is still limited amongst academics. Those using LinkedIn as a means for network building or knowledge acquisition will only be able to communicate with a sub-set of academics. While this is unlikely to be of consequence within the academic community, where reputation continues to be largely built via traditional scholarly means, such as publications and conferences (Jamali et al. 2016), this can impact how prospective students and non-academic audiences or collaborators perceive academics' reputation and science more widely. Moreover, there is a growing importance of social media metrics, such as altmetrics, both for evaluation purposes to measure the social impact of research, and as a source of data in scholarly research. This raises the question of how accurately these sources represent the academic community, as any evaluations or analyses based on such data may miss out on a significant proportion of the science base if LinkedIn users are not representative of the academic population.

This paper contributes to our knowledge of LinkedIn use by looking at its adoption amongst a representative sample of UK academics, and sheds light on the rate of LinkedIn adoption by academics, which helps to understand its antecedents in terms of demographic factors and how it relates to academics' scholarly activity.

2. SNS in the research profession

Social networking services (SNS) are widely permeated academic life, and although the adoption of SNS by researchers has evolved slowly scientist (Collins et al. 2016, Bik & Goldstein, 2013; Carrigan, 2016), and we cannot claim that the mastering of social media is a trait in. The nature of academic activities has become one where academics are expected and encouraged to have online presence, to engage with their community and expand their impact outside this community. SNS have given place to new forms of engagement and influence for researchers, and expanded collaboration and career progression opportunities. The usage of

SNS is not limited to sharing scientific outputs or ideas. The variety of platforms allows researchers to communicate with a wide range of stakeholders, and in doing so the utilisation of SNSs creates varied patterns of interaction in which academics connect with peers and receive recognition (Bik & Goldstein, 2013; Nentwich & König, 2014), openly voice their views about relevant ongoing issues to pertinent authorities and take a stance on structural socio-economic issues (e.g., racism and gender inequality). Consequently, researchers' have become more versatile in disseminating their findings, ideas, earn experience, and teaching content, tailoring content adequate for the audience and purpose of the different platforms (Gaughan, et al. 2018, Melkers et al. 2017; Maloney et al. 2015; Huastein et al, 2014; Van Noorden, 2014). In this regard, previous studies have identified patterns of engagement and behaviour where, outside the platforms through which academics communicate with their community (e.g Academia, Mendeley, Research Gate, etc), academics make less use of blogs, Twitter or LinkedIn, and Facebook is primarily used to connect with family and friends and less with peers or external stakeholders (Collins et al. 2016). Similar studies have demonstrated that knowledge communications practices particular to scientific fields matter when it comes to explaining the adoption and characterisation of SNS usage across researchers (see Ortega, 2015).

2.1 Almetrics and impact

Along with the patterns of interests among disciplines relying on SNS to disseminate research, scholars have looked at SNS as proxies of quality and impact, and their advantages for performance measuring (Sugimoto et al. 2017; Ortega et al, 2015). SNS are not only online records containing the educational information about researchers, SNS are alive repositories recording the research outputs (e.g. research papers, data, pre-prints, etc) that researchers voluntarily upload to their sites, as well as recording in real time the interactions that researchers initiate or react to via digital direct digital communication that may transform into tangible benefits. SNS reflect the 'attractiveness' and impact of researchers' activities in the form of number of visits, likes, recommendations, retweets, reads, downloads. As quasi indicators of impact via visibility SNS can elicit -self, community and organisational incentives leading to gamification of research activities (Sugimoto et al, 2017), which could shift the focus from actual research quality to simulations of research.

The use of SNS by academics signals undergoing changes in researchers' identities, dialogues, and communication strategies (Aguillo, 2020; Williams & Woodacre, 2016; van Dijck, 2013). Most of the existing literature has looked into the changes and benefits of communications strategies. For instance, scholars have asserted that online presence would yield benefits for the active researchers. This is that interactions via SNS would help create and strengthen connections, facilitate collaborations, sharing research outputs, signal research interests and expertise (Tran & Lyon, 2014; Jamali et al, 2016; Mas-Bleda, et al. 2014). Due to the overarching role of SNS in researcher's visibility, their use is also expected to affect career development. SNS are behaviour changing artefacts, and as such their usage has become an increasingly important tool among research communities for visibility, career development and prestige.

2.2 Limitations of SNS as measures of impact

The use of SNS for professional purposes is still limited amongst academics. Those using LinkedIn as a means for network building or knowledge acquisition will only be able to communicate with a sub-set of academics. While this is unlikely to be of consequence within the academic community, where reputation continues to be largely built via traditional

scholarly means, such as publications and conferences (Jamali et al. 2016), this can impact how prospective students and non-academic audiences or collaborators perceive academics' reputation and science more widely. Moreover, there is a growing importance of social media metrics, such as altmetrics, both for evaluation purposes to measure the social impact of research, and as a source of data in scholarly research. This raises the question of how accurately these sources represent the academic community, as any evaluations or analyses based on such data may miss out on a significant proportion of the science base if LinkedIn users are not representative of the academic population.

3 LinkedIn: underpinning mechanisms and explanations for impact

Social networking sites (SNS) represent an increasingly important tool for universities and individual academics. LinkedIn has emerged as amongst the tools most widely used by academics in recent years. It is also the SNS where non-academic users (including prospective students or users of research, including employers) seek out professional information, including such related to careers, and is gaining in importance for academic labour markets too, such as recruitment of students and young researchers, or for those wishing to transition to a different sector.

Yet, the use of SNS for professional purposes is still limited amongst academics. Those using LinkedIn as a means for network building or knowledge acquisition will only be able to communicate with a sub-set of academics. While this is unlikely to be of consequence within the academic community, where reputation continues to be largely built via traditional scholarly means, such as publications and conferences (Jamali et al. 2016), this can impact how prospective students and non-academic audiences or collaborators perceive academics' reputation and science more widely. Moreover, there is a growing importance of social media metrics, such as altmetrics, both for evaluation purposes to measure the social impact of research, and as a source of data in scholarly research.

With the rise of altmetrics and webometrics, as measurement approaches to study the relationships between researchers' productivity, i.e. publications, and scholarly communication patterns in the broader sense, academics are encouraged either by pressures of the environment or by their interest in broadening their audiences to build an online presence (Aguillo, 2020; Baruffaldi et al., 2017; Jamali et al., 2016; Orduña-Malea et al., 2013). Consolidating a visible image online, be this via institutional websites, personal websites, and social media platforms (e.g. ResearchGate, Academia, CiteUlike, CrossRef, Datadryad, Facebook, Figshare, Google+, GitHub, Instagram, LinkedIn, Scribd, SlideShare, Tumblr, Twitter) can induce significant impact within research communities and across other relevant stakeholders, such as research users, potential employers and funders. Moreover, new forms of knowledge creation and knowledge exchange facilitated via online platforms are emerging to address societal challenges (Beck et al., 2022).

4. Data and Methods

In this research we constructed a unique database combining information from multiple sources. First, we build on data from a large-scale survey of academics in the UK. The survey was conducted by the Centre of Business Research (CBR) in 2015 and targeted academics at all UK universities and in all disciplinary fields (Hughes et al., 2016). The survey asked about academics' engagement with non-academic actors during the prior three year period. It asked about different engagement activities, ranging from consulting, to joint research, to lectures for the community, and the number of times each activity took place. It also asked about sector of

engagement: private, public and third sector. The survey further included questions on demographic characteristics, research orientation, prior work experience and career motivations. This survey is the most comprehensive database of UK academics and therefore suitable for this research. To conduct the survey, CBR collected e-mail contact information from the websites of universities, which resulted in a population of approximately 140,000 academics, of which 18,177 responded to the survey (complete responses only). Survey questions referred to respondents' current employment, or to the last three years (the period 2012-2015) when enquiring about academic engagement activities. A non-response bias analysis available in Hughes et al. (2016) shows little to no bias in the survey data which can thus be considered representative of the UK academic population. We removed any respondents that were retired, on teaching only contracts or in research assistant positions, and any observations with empty values in any of the responses of interest. This left us with a sample of 14,538 academics.

While the original survey enquired about academic engagement, it did not consider social media use. We therefore collected public LinkedIn profiles via LiveAlumni in 2017. To protect the identity of our respondents, we did not share any survey information with LiveAlumni, but instead used name and institution information collected from public websites.¹ We were able to find LinkedIn records for approximately 48% of UK academics, a success rate that did not differ between survey respondents and non-respondents.² We merged LinkedIn records with the survey data after checking manually that they were correctly identified.

The survey data was further complemented with information from other individual-level datasets. Specifically, we added information from the UK research councils (UKRI) on whether respondents held any research funding as principal investigators during the 2012-2015 period. Data was taken from the UKRI's Gateway to Research (GtR) or provided by the councils directly. We further collected publication information for academics' full careers from Scopus, including citation and co-author counts. Specifically, we performed text field searches on academics' names using Python and screened matches manually based on survey information. This process successfully identified the publication records of approximately 70% of respondents. We further manually searched Scopus for any respondents where the semi-automated process did not yield results, using publication lists on personal websites as a search guide. This enabled us to identify publications for another 14% of respondents. The remaining 16% did not return any publications and had to be dropped from the analysis³.

We take advantage of questions that ask about 27 different types of non-commercial engagement and four types of commercialisation channels, including the frequency with which each is used (regardless of sector of engagement), ranging from 0 to 10+. We categorise these activities into five groups: training, meetings, research, commercialisation and public engagement.⁴ Figure 2 shows the differences in these measures between the two groups of

¹ A data protection agreement was in place.

² LiveAlumni only returns profiles that are "public", i.e. do not require user log-in. The overall rate of LinkedIn use amongst UK academics could thus be higher. We also compared LinkedIn results for survey respondents and non-respondents to check for any biases. We found no significant differences in the incidence of LinkedIn profiles (48% vs 45%, $p > 0.1$), in the share of profiles with a profile photo (58% vs. 57%, $p > 0.9$), and the share of profiles with 500 or more contacts (15% vs. 12%, $p > 0.1$).

³ Publication information is missing for 17% of the sample. These are mostly academics at teaching institutions, in the arts, and with a stronger focus on teaching and applied research. However, we cannot assume that these respondents have zero publications (given that all indicate some research activity), and therefore need to drop them from the analysis.

⁴ A principal component analysis (unreported) helps to determine potentially underlying common rationales of engagement. The Kaiser-Meyer-Olkin measure of sampling adequacy is 0.899. The Bartlett test of sphericity rejects the hypothesis that

academics. It shows that non-users of LinkedIn are less involved in the majority of engagement activities. Perhaps unexpectedly, this difference is smallest for public engagement, which we may have associated more readily with social network sites.

Figure 1: Sector of Non-academic engagement

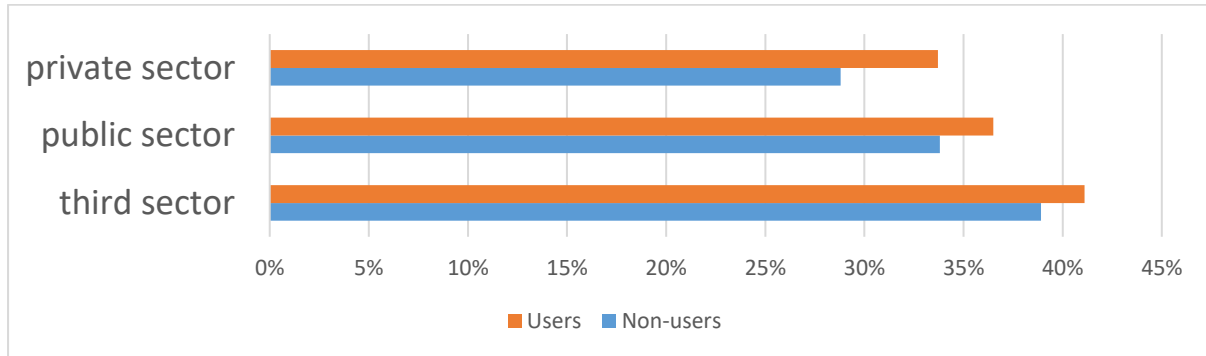


Figure 2: Activity of Non-academic engagement

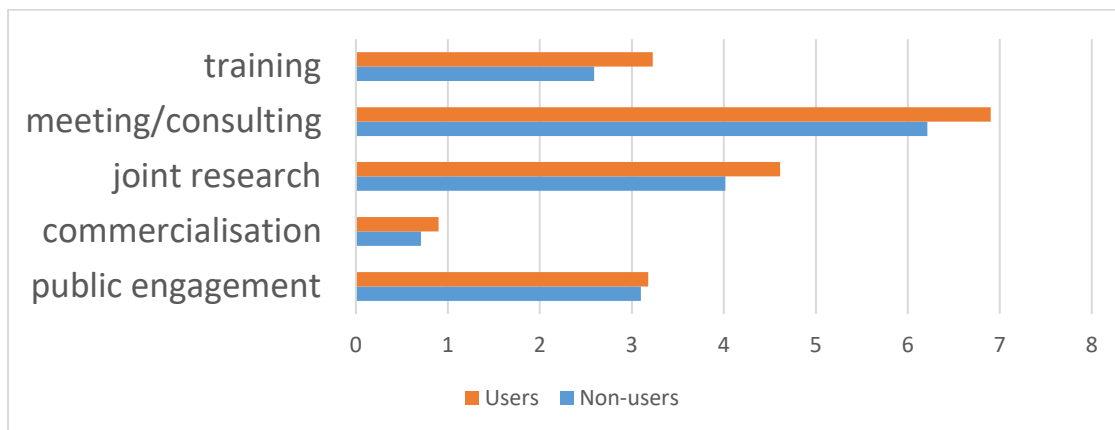


Table 1: Descriptive Statistics

Variables	Not on LinkedIn	LinkedIn account	
N	6016	6167	<i>p</i>
Female	0.41	0.40	
Foreign born	0.39	0.36	***
<40	0.34	0.32	***
>49	0.37	0.39	**
Professor	0.24	0.24	
SL/Reader	0.31	0.36	***
Lecturer	0.21	0.20	

variables are not intercorrelated, confirming that the variables are suitable for factor analysis. The Crohnbach's alpha is 0.846 confirming that the scales are reliable.

Research fellow/Postdoc	0.24	0.20	***
Social Sciences	0.29	0.30	**
Health science	0.20	0.17	***
Life Sciences	0.14	0.16	**
Arts/Humanities	0.15	0.12	***
Physics/Maths	0.15	0.14	
Engineering	0.07	0.11	***
Basic research	0.29	0.24	***
User-inspired	0.25	0.29	***
Applied research	0.42	0.46	***
Industry experience	0.39	0.44	***
UKRI PI Funding	0.14	0.13	
Publications	7.75	7.84	
Citations	16.44	15.11	***
Coauthors	4.22	4.09	
Uni REF score	2.87	2.83	***
Uni Research income pP	81.48	59.04	***

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

5. Results

We estimate Heckman selection models. The first stage looks at the likelihood of a LinkedIn profile being found. The second stage then considers the extent of LinkedIn use amongst those with a profile, considering the number of connections and profile completeness.

Table 2 reports results for stage 1. It shows that academics with prior industry experience and more coauthorship connections are more likely to have a LinkedIn profile. Also, applied researchers and UK natives are more often found on LinkedIn.

Table 3 then presents the second stage regression, reporting coefficients for the control variables. It shows that male professors, those with industry experience and foreign-born researchers have a more active presence on LinkedIn. There is thus an indication that not all academics are equally presented on SNSs.

Figure 3 reports the marginal effect results for our main independent variables, controlling for all measures as reported in Table 3. The results show that more active LinkedIn use is associated with private sector engagement and with engagement via meetings, consulting or training activities.

6. Discussion

In this research we shed some light on profile of academics using LinkedIn. We provide insights into how profile characteristics relate to other academic characteristics (e.g. publications) and (traditional) academic engagement. We find that while LinkedIn is not less likely to be used by women or those from less well endowed universities, senior men and those from elite institutions are better connected and thus more visible on LinkedIn. These insights suggest that LinkedIn may misrepresent academic research as it is perceived by external, non-

academic communities and potentially exacerbating existing inequalities in science. It also gives more visibility to academics in applied fields who may find it more useful for their work.

We further find that LinkedIn use amongst UK scientists correlates with private sector engagement, but not to engagement with other sectors. It also relates to engagement activities that are training related (executive teaching, joint curriculum development, student placements) and meeting/consulting related. This suggests that LinkedIn use, and potentially other altmetric indicators, are only a partial substitute for traditional engagement and knowledge transfer measures. Importantly, private sector engagement is already well captured by existing measures, while public and third sector are not. LinkedIn data is not able to close this gap. Moreover, LinkedIn indicates general linkages which may often be informal, rather than research or commercialisation based.

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Open science practices

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Author contributions

Cornelia Lawson: Conceptualization, Methodology, Data collection, Writing.

Mayra M. Tirado: Conceptualization, Literature review, Writing.

Competing interests

Authors declare no competing interests.

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Table 2: Heckman selection Stage 1 (abbreviated results)

	LinkedIn Use	
	Coef.	Robust SE
40-49	ns	
>49	ns	
Female	ns	
Foreign born	-0.076***	(0.026)
Industry experience	0.075***	(0.027)
Public or third sector experience	0.031	(0.034)
Senior lecturer / Reader	0.093***	(0.035)
Lecturer	ns	
Research fellow/postdoc	ns	
Intrinsic motivation	+	
extrinsic motivation	+	
Publications	ns	
Citations	ns	
Co-authors	0.050**	(0.024)
Uni research income pP	-0.003***	(0.000)

Basic Research	-0.147***	(0.030)
User-Inspired	0.010	(0.037)
UKRI PI funding	-0.060*	(0.034)

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Heckman selection Stage 2

	500+ Connections (0/1)		Complete profile (0/1)	
	Coef	robust SE	Coef	robust SE
40-49	-0.062	(0.055)	-0.300***	(0.049)
>49	-0.174**	(0.077)	-0.591***	(0.067)
Female	-0.254***	(0.087)	-0.122***	(0.037)
Foreign born	0.191***	(0.043)	0.074*	(0.042)
Industry experience	0.179*	(0.105)	0.204***	(0.037)
Public/third sector experience	-0.031	(0.055)	0.066	(0.048)
Senior lecturer/reader	-0.222***	(0.057)	-0.016	(0.053)
Lecturer	-0.275***	(0.098)	0.045	(0.060)
Research fellow/postdoc	-0.414***	(0.155)	0.254***	(0.069)
Intrinsic motivation	0.094	(0.065)	0.048	(0.038)
extrinsic motivation	-0.031	(0.042)	0.098***	(0.031)
Publications	0.098*	(0.050)	-0.040	(0.038)
Citations	0.004	(0.021)	0.043**	(0.020)
Coauthors	-0.131***	(0.043)	-0.079**	(0.038)
Uni research income pP	0.002***	(0.001)	-0.001	(0.001)

Note: Includes discipline and uni type controls, and REF score; Base categories: <40, no experience, professor; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

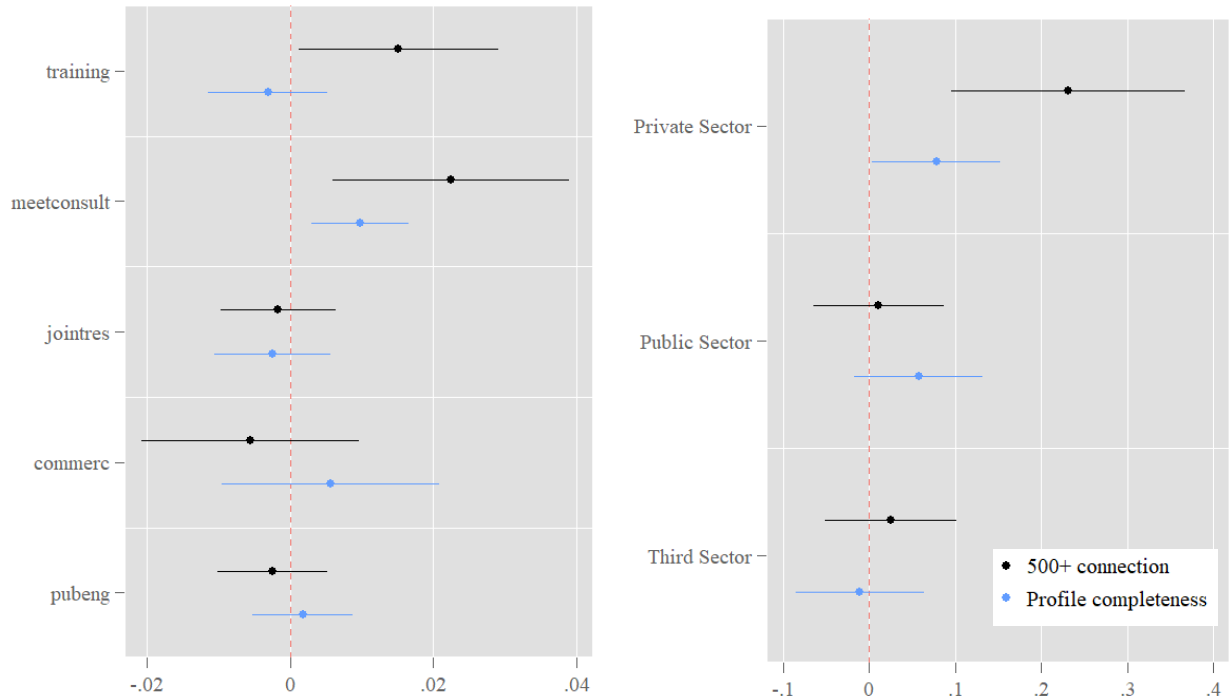


Figure 3: Marginal effects of 2nd stage Heckman selection model.