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Conference Paper

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Enriching the knowledge of altmetrics studies by exploring social media metrics for Economic and Business Studies journals

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ABSTRACT
We present a case study of articles published in 30 journals from Economics and Business Studies (EBS) by using social media metrics from Altmetric.com. Our results confirm that altmetric information is significantly better present for recent articles. The Top 3 most used altmetric sources in EBS-journals are Mendeley, Twitter, and News. Low but positive correlations (r=0.2991) are identified between citation counts and Altmetric Scores on article level but they increase on journal level (r=0.614). However, articles from highly cited journals do neither receive high online attention nor are they better represented on social media.

INTRODUCTION
Nowadays, scholarly journal evaluation and selection by citation indexes (Garfield, 1972) appears to be a debatable story because of the vast amount of studies confirming problematic implications of citation-based indicators (Seglen, 1997), and the rising resistance against inadequate use of the journal impact factor (see e.g., the Leiden Manifesto[1]). In response, the introduction of social media tools has led to various social media metrics which are used as indicators for research assessments (Priem et al., 2010; Wouters & Costas, 2012). Altmetrics use sources from the Social Web such as Twitter, Facebook, or reference management tools to quantify the impact of scholarly publications on social media users and can appear more rapidly than citations. Haustein (2016) emphasizes that any metric whether is citation or social media based, has to be wisely chosen depending on the assessment aim. Thus, altmetrics and citation counts are two different measures (Costas et al., 2015). Peters et al. (2014) observed that by using only a subset of social media metrics for research evaluation the results might not correctly reflect the impact of the publications on users. Many studies such as Thelwall et al. (2013) and Costas et al. (2015) reveal that altmetric indicators are associated with citation counts in several disciplines (e.g., biomedical and health sciences, social sciences and humanities, mathematics, life and earth sciences). Altmetrics found application in various fields, e.g., in showcasing scholarly works (i.e. ImpactStory.com).

Also, libraries became interested in using altmetrics data to facilitate filtering of publications and providing context information to publications. It is reasonable for libraries to know which aspects can be implemented in a reasonable way, where sufficient data is available for valid analyses, what altmetrics window (analogous to the citation time window) should be used, and which altmetrics aggregator is the best choice for the goals set.
Therefore, contributions to the enhancement of the methodology used for studies and for implementations of social media metrics in real-world applications are needed in order to avoid misinterpretation of indicators in a specific discipline and creation of unintended peripheries by un-reflected use of alternative, as well as traditional, scholarly metrics.

[1] http://www.leidenmanifesto.org

This case study in Economics and Business Studies (EBS) literature will enhance the discussion of altmetrics and can act as starting point for studies in similar environments. We complement the knowledge on disciplinary peculiarities of altmetrics in order to enhance methodology and interpretation of altmetrics studies in the future.

By using social media metrics provided by the aggregator Altmetric.com we show, for example, how to limit temporal biases in sample creation and what questions to ask when results are set. In the long run, such case studies may help researchers to effectively disseminate or easily evaluate scientific publications since they know which tools are mostly used in what disciplines by what people for which purposes.

The study aims at answering following specific research questions:

RQ1: What is the coverage of journals from EBS in Altmetric.com?

RQ2: Which are the most used altmetric sources for publications from EBS and therefore work best for providing altmetric indicators?

RQ3: Do altmetrics indicators relate to citation counts of publications?

RQ4: Is there any relation between impact factors and the score numbers aggregated by Altmetric.com to reflect importance of journals?

METHODS AND DATA[2]

The case study on EBS relies on altmetric data provided by the social media metrics aggregator Altmetric.com and on citation data provided by Thomson Reuters' Web of Science (WoS). Altmetric.com collects information for research output found online from specified sources such as social media platforms, traditional media, and online reference managers. In contrast to WoS Altmetric.com looks for both, sources that are related to scholarly content as well as references that rather stem from mainstream media (like popular news outlets). However, analyzed sources need to have APIs to be included in Altmetric.com's index (Robinson-García et al., 2014).

Several studies showed before that the social reference manager Mendeley is a vital reservoir for altmetric data that correlates moderately well with citation counts (amongst others: Zahedi et al., 2015; Thelwall et al., 2013). When working with Altmetric.com it has to be kept in mind, however, that although Altmetric.com retrieves and displays Mendeley reader counts for each available DOI, only those DOIs are saved in the Altmetric.com for which at least one other social media metric (such as Twitter, news, etc.) has been found. Mendeley is not included in the Altmetric Score of Altmetric.com[3]. Hence, some studies working with data from this provider exclude Mendeley from their analyses (e.g., Costas et al., 2015).

Dataset 1: Coverage of Publications from EBS on Social Media Platforms

We created Dataset I in order to compare altmetrics with citation data of EBS articles and to find the best time span for journal publications with a sufficient amount of altmetrics data. This dataset contains articles that are published in the Top 30 EBS-journals (see Nuredini &

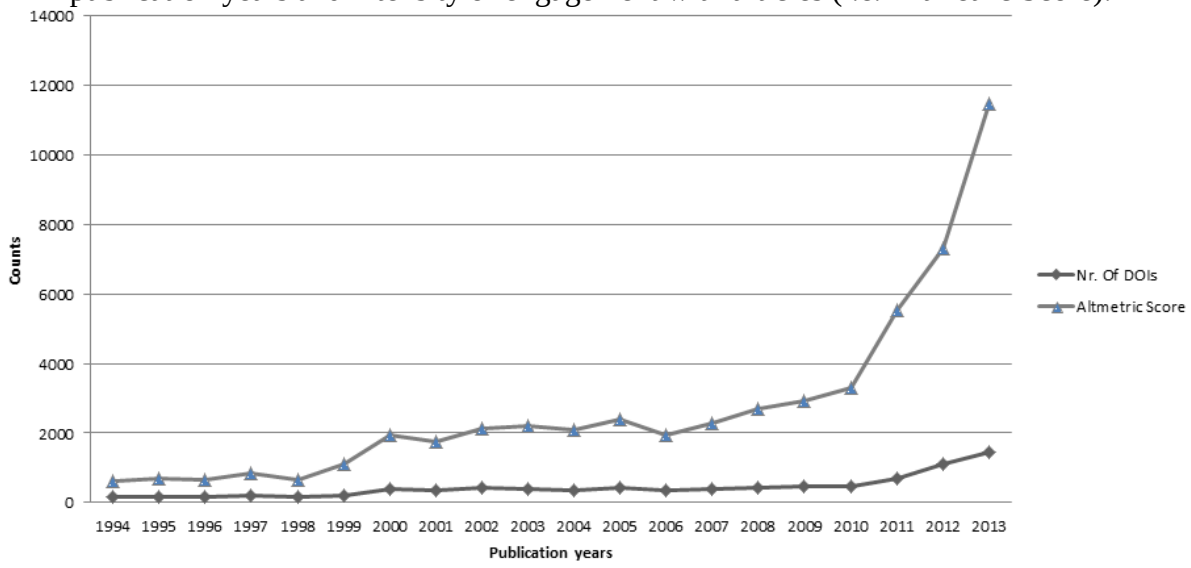
[2]We thank Fran Davies from Altmetric.com for providing altmetric data and Stefanie Haustein and Vincent Larivière from the Université de Montréal & the Observatoire des Sciences et des Technologies (UQAM) for citation data.

[3] https://help.altmetric.com/support/solutions/articles/6000060969-how-is-the-altmetric-attention-score-calculated-

Peters, 2015). The data selection is built on journals from the Handelsblatt[4] journal ranking of which 15 come from Business Studies (Handelsblatt in 2012[5]) and the other half is from Economics (from the Handelsblatt 2010[6]). The dataset is composed of 51,473 DOIs and the articles are restricted to the publication years 1994-2013.

Social media metrics from Altmetric.com were requested for articles of those 30 journals and the search was conducted via journal names. On 27.11.2015 the data came on bulk with a total set of 13,597 DOIs. To filter the year of the publications (1994-2013) the DOIs from Altmetric.com have been matched with the 51,473 DOIs from Nuredini and Peters (2015) resulting in 8,763 DOIs forming Dataset 1 (see Table 1).

Figure 1. Dataset 1: Coverage of DOIs (n=8,763) on social media platforms across 20 publication years and intensity of engagement with articles (i.e. Altmetric Score).



Altmetrics data are present for a bigger share of articles published in recent years (Figure 1). From the publication year 2011 onwards every year more than 10% of the DOIs searched obtained altmetric attention, so it can be concluded that from 2011 there is a considerable and steadily increasing amount of EBS literature available on social media platforms. This temporal bias in altmetric indicators has been already mentioned in earlier studies (e.g., Costas et al., 2015). Moreover, the engagement rates per publication have significantly increased since 2011. Hence, to make adequate use of social media metrics in the field of EBS only publications published from the year 2011 onwards should be considered for further analyses.

[4] handelsblatt.com

[5] https://docs.google.com/spreadsheets/d/1GaU_tSl3kC2FtE7xYnSEIktSX9DUKei_qhQKipqyJQ4/pub?output=html

[6] http://tool.handelsblatt.com/tabelle/?id=33

Dataset 2: Comparison of Altmetric Indicators with Citation Counts and Journal Metrics
Given that the analysis of Dataset 1 revealed a strong bias in altmetrics counts towards recent publications a second dataset was compiled. In order to reduce temporal biases in the comparison of citation numbers from WoS (2014 citation counts), i.e. citation delay bias, and altmetrics counts, i.e. social media uptake bias, the study will only analyze articles published from 2012 until 2014.

The Crossref API was queried by ISSN for retrieving the article DOIs of Dataset 1 but restricted to the publication years 2012-2014. This resulted in a total number of 9,045 articles. Then, the list of DOIs from Crossref was matched with the Altmetric.com data and the citation data obtained from WoS. The matching resulted in 3,466 DOIs having social media metrics and 7,410 DOIs found in WoS of which 6,966 have at least one citation (see Table 1).

Table 1. Quantitative description of datasets 1 and 2.

Dataset	**Publication Years**	**Number of DOIs via Crossref**	**Number of DOIs found in Altmetric.com**	**Number of DOIs found in WoS with >0 citations**
Dataset 1	1994 - 2013	51,473	8,763*	-
Dataset 2	2012 - 2014	9,045	3,466**(*)	6,966
			Number of DOIs having Altmetric and Citation counts	
			3,275***	

*used in RQ1, **used in RQ2, ***used in RQ3, (*) used in RQ4

RESULTS

RQ1: Journal coverage in Altmetric.com

In Table 2, the coverage of articles in Altmetric.com is shown per journal. Overall, 38% of 9,045 searched DOIs are covered, meaning that those 3,466 publications have been mentioned at least once on social media platforms. The highest share of articles represented in the database of Altmetric.com is found for the Quarterly Journal of Economics, where more than two thirds of the published articles have social media metrics. The Journal of Business Research has the highest number of DOIs available but engagement with its articles in the online world is rather low (only 14% of DOIs have altmetrics). The American Economic Review (AER) has the second highest number of articles published and also the highest number of DOIs found in Altmetric.com. But in terms of coverage AER is only on rank 12 (with only 38% of all articles found in Altmetric.com). This is a remarkable result since both journals allow online access, and what is more, AER even has social media buttons integrated into its web pages; functionalities expected to drive users sharing articles within their social media accounts.

When comparing the availability of social media metrics per year the analysis revealed that coverage is steadily increasing for recent publication years: 33% of the DOIs published in 2012 were found in Altmetric.com, 41% from 2013 and 42% from 2014.

Table 2 also shows the journals' Impact Factors (IF) from the 2014 edition of Journal Citation Reports (JCR). Moreover, for each journal the Altmetric Score is displayed, which sums up

all social media metrics for each article. The Altmetric Score is defined from Altmetric.com by quantity (the higher the attention, the higher the score) and quality (different social media sources differently impact the score)[7].

Table 2. Journal metrics ranked according to coverage of articles found in Altmetric.com.

Journals	# DOIs found in Crossref	# DOIs found in Altmetric.com	Coverage of articles in Altmetric.com	Impact Factor (IF)	Altmetric Score
Quarterly Journal of Economics	221	147	67%	6.654	3135
Journal of Health Economics	392	219	56%	2.579	3021
Journal of Consumer Research	411	214	52%	3.125	7985
Economic Journal	371	193	52%	2.336	3561
American Political Science Review	257	124	48%	3.688	2158
Review of Economic Studies	197	94	48%	4.038	102
Journal of Marketing	202	92	46%	3.938	1162
International Organization	180	79	44%	3.019	108
Journal of Finance	446	193	43%	5.424	1287
Administrative Science Quarterly	195	84	43%	3.333	171
Journal of Political Economy	185	78	42%	3.593	626
American Economic Review	1087	415	38%	3.673	5255
Journal of Labor Economics	143	53	37%	1.893	476
Journal of Econometrics	698	238	34%	1.600	500
Econometrica	388	126	32%	3.889	606
Management Science	852	225	26%	2.482	1978
Journal of Marketing Research	292	68	23%	2.256	1721
Academy of Management Journal	375	80	21%	6.448	1502
Journal of Financial Economics	553	117	21%	4.047	855
Journal of Monetary Economics	361	74	20%	1.726	374
Information Systems Research	260	52	20%	2.436	245
The Annals of Statistics	420	66	16%	2.180	173
European Economic Review	496	74	15%	1.444	557
Journal of Business Research	1495	207	14%	1.480	904
Journal of Accounting and Economics	204	28	14%	2.724	95
Academy of Management Review	216	23	11%	7.475	228
International Economic Review	224	22	10%	1.210	319
Games and Economic Behavior	612	49	8%	1.067	101
Journal of Economic Theory	553	43	8%	1.033	191
Journal of Business and Economic Statistics	282	16	6%	2.241	49

RQ2: Best providers of altmetric sources

Table 3 displays 14 sources for which altmetrics for the DOIs of Dataset 2 have been collected by Altmetric.com. By summing up the usage numbers that every social media

[7] https://help.altmetric.com/support/solutions/articles/6000059309-about-altmetric-and-the-altmetric-score

source tracked by Altmetric.com has achieved the "Total count of Altmetric events" is calculated. For example, we summed up the number of tweets of Twitter from every article in our dataset resulting in 21,716 counts in total.

Table 3. Sources found in Altmetric.com for 3,466 DOIs.

Altmetric Source	Total Count of Altmetric Events	Number of DOIs found for this altmetric source	Mean Events per Publication
Mendeley	159,354	3,333	47,81
Twitter	21,716	3,080	4,95
CiteUlike	329	258	1,27
Blogs	833	577	1,44
Wikipedia	126	102	1,23
News	1,186	421	2,81
Policy_Documents	183	165	1,10
Facebook	581	398	1,46
Google+	198	122	1,62
Weibo	131	86	1,52
Reddit	71	42	1,69
F_1000	4	4	1
Peer_review	4	4	1
Pinterest	7	7	1

As observed before, 77% of articles from our dataset have altmetric readership counts from Mendeley; hence it is the source providing most altmetric counts for EBS publications. Twitter has 88% of the found DOIs, News sum up to 34%, mentions in Blogs to 24%, Facebook shares are 16%, and other sources are below 15% each. Interestingly, although most of the DOIs from the dataset have been found on Mendeley there is still a small share of 3.84% of DOIs which could not be found via this social reference tool but via other services.

Nevertheless, besides that Mendeley accumulates more metrics Twitter, Blogs, Facebook, and news are identified as sources of substantial altmetric data in EBS. The coverage of Top 30 journals in 13 social media sources is shown in Figure 2. We have excluded Mendeley from the chart because of its over-proportional counts and coverage. EBS journals are often mentioned in Twitter, News and Blogs showing that journals covering topics of general interest exhibit other social media metrics then journals with a narrower focus.

RQ3: Relationship between social media metrics and citation counts

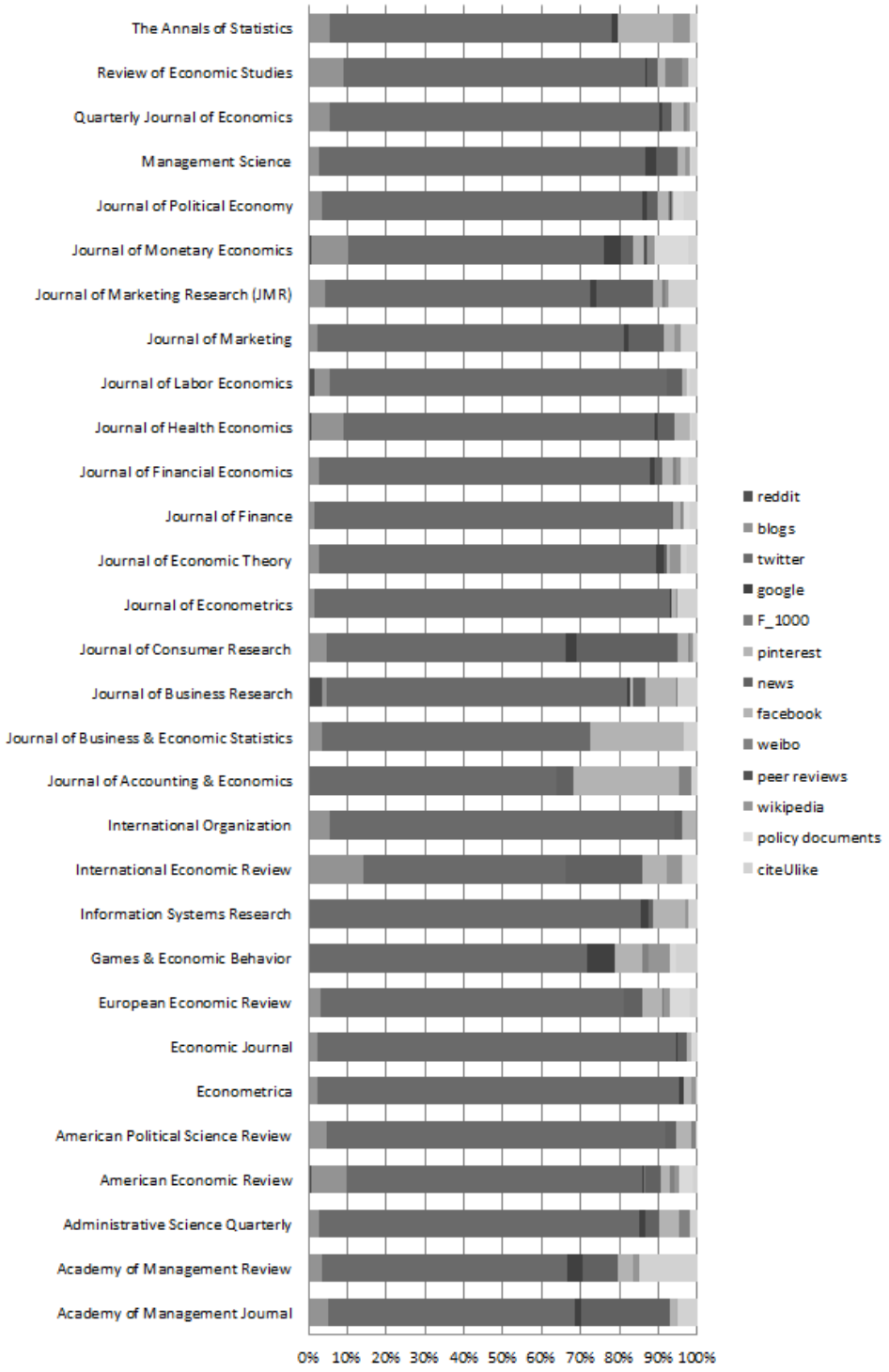
For the publication years 2012-2014, 3,275 articles from 30 EBS journals were found with both citation and altmetric data. The Spearman correlation between citation rates and altmetric scores for 3,275 articles on article level is r=0.2991. It indicates a positive but low correlation between these two attributes; however, Spearman correlation for the 3,275 articles between citation and Altmetric Scores on journal level is r=0.614. We may speculate here that particular journals are more successful in triggering (or harmonizing) both social media and scientific attention (via citations), but we have to back up this assumption by further investigation.

RQ4: Relationship between IF and Altmetric Score

The correlation between IF and Altmetric Score on journal level is low but positive (Spearman r=0.314 and Pearson p=0.169) – hence we can conclude that articles from highly cited journals are not receiving substantial attention online. Additionally, articles of highly

cited journals are not better covered on social media platforms since no correlation (Pearson p=0.07) between the number of DOIs found in Altmetric.com and the IF can be detected.

Figure 2. Social media sources from Altmetric.com on journal level (without Mendeley).



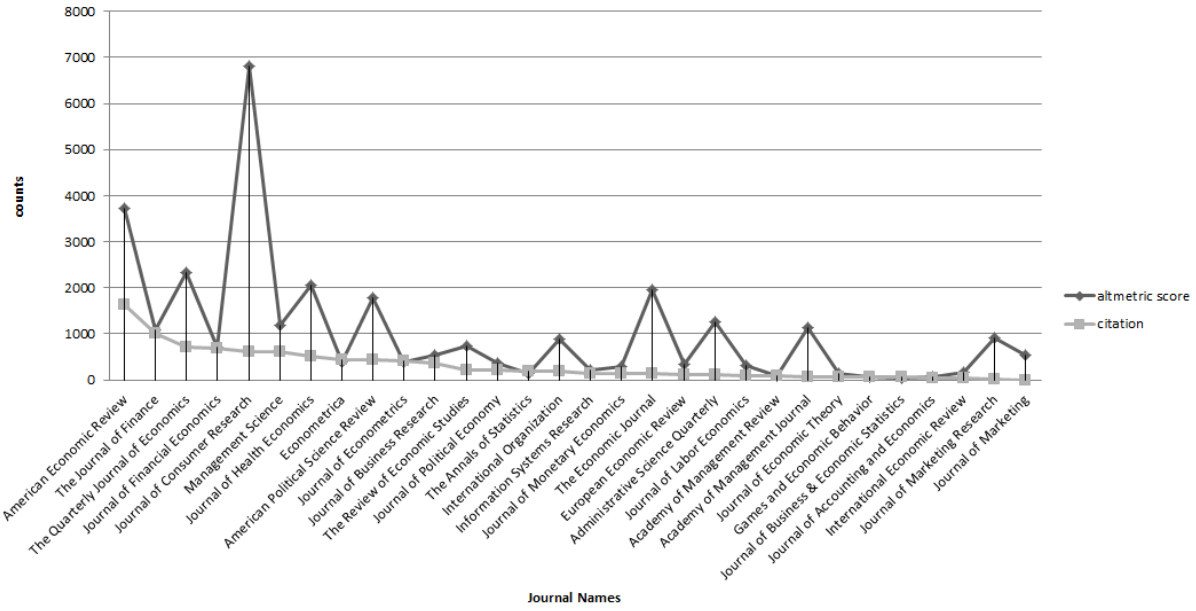
DISCUSSION OF RESULTS

We found that – besides Mendeley – Twitter is the dominating social media platform for EBS journal articles which confirms the results of other studies (Robinson-García et al., 2014). In contrast to other disciplines (Thelwall et al., 2013) blogs are also frequently used for discussion of literature from EBS. As it has been shown (Costas et al., 2015) blogs and tweets

have stronger relations with citations and therefore better support identification of highly cited articles. Hence, in EBS indicators derived from engagement with blogs and Twitter may serve as valuable addition to traditional metrics.

The analyses also revealed that for articles in EBS altmetrics data is still rather sparse, although availability increased for more recent articles. However, when considering altmetrics data for real-world application (e.g., in libraries) higher aggregation levels, such as journal level, can well overcome the sparsity of altmetrics data. By doing so, it will be ensured that for every record altmetric information could be displayed which lowers, or even avoids, user frustration.

Figure 3. Comparison of Altmetric Scores and citation counts on journal level.



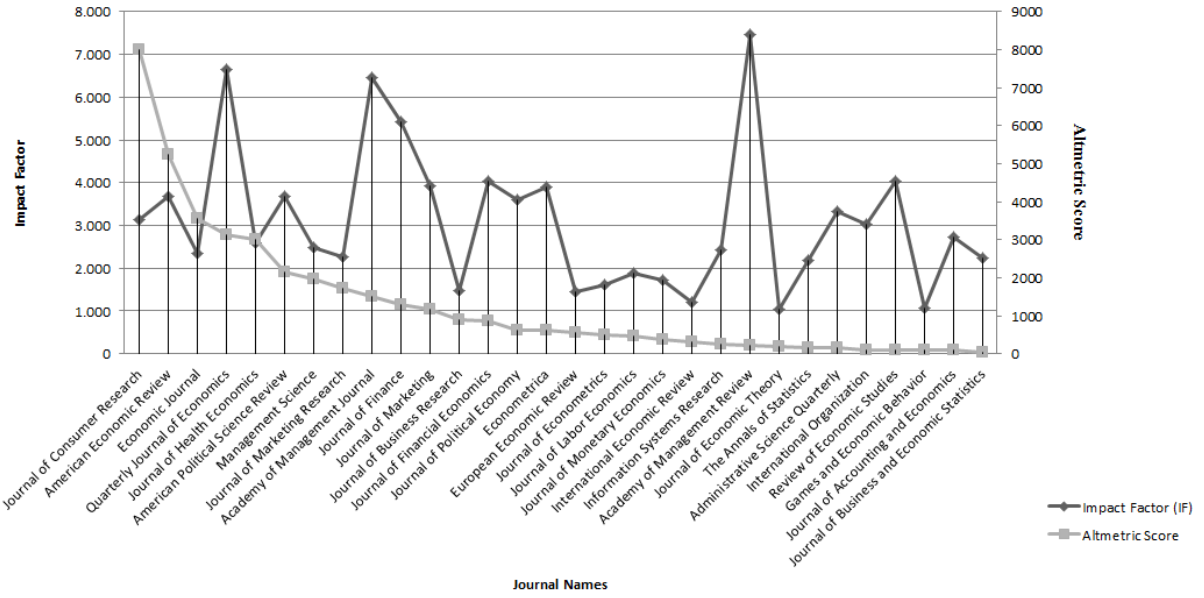
CONCLUSION

We presented an altmetric case study of articles published in the Top 30 journals from Economics and Business Studies by using social media metrics from Altmetric.com. Our results confirm that altmetric information is significantly better present for recent articles. Overall, 38% of articles published in 2012-2014 are represented in Altmetric.com.

The Top 3 most used altmetric sources are Mendeley, Twitter, and News – with Mendeley being the most complete platform for EBS journals (see also Nuredini & Peters, 2015). We could show that Altmetric Scores and citation counts are better correlated on journal level than on article level. On the other hand, the correlation between Altmetric Scores for journals as well as coverage on social media platforms and IFs are low but positive. This shows that 1) articles from highly cited journals do not receive substantial attention online, and 2) altmetrics complement information on the impact of journals provided by traditional indicators.

In order to better understand the relationship of web-based formats of and engagement with scholarly articles, future work will include the analysis of coverage of open access journals from EBS on social media platforms and the expansion of the comparison of Altmetric Scores with citation data by using Google citations.

Figure 4. Comparison of Altmetric scores and IFs on journal level.



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