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An Expanded Bibliometric Study of Articles on Emerging Markets

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Abstract:

Research Question: Bibliometric analysis of the literature on emerging markets aims to recognise the relationship between traditional metrics (i.e., citations) and alternative metrics (i.e., altmetrics) in this field. **Motivation:** This study is motivated by existing difficulties in measuring both the quality and societal effects of research papers. There are divided opinions among critics considering whether traditional metrics represent similar measures in comparison with altmetrics, or whether scientific and public attention are principally different categories. The study focuses on a specific field – emerging markets, considering that both opinions of scientists and the crowd are essential for driving appropriate societal changes. Understanding both metrics' nature is crucial for their proper usage to support sustainable development efforts and link research project evaluation and financing in the field. **Idea:** The main idea is to examine the relationship between the number of citations and altmetric indicators and to determine the extent of overlapping individual papers/journals in the sample with the best ranking results in both categories. **Data:** The study uses data about articles on the topic of "emerging markets" exported from the Web of Science (WoS) database and expanded with altmetric indicators (either from providers Altmetric.com or PlumX, depending on the publisher). There are 3996 valid records collected during November 2019. **Tools:** This paper considers only altmetric indicators common to both providers. Analyses on the relationship of the number of citations and altmetric indicators (Pearson correlation and percentage of overlapping of top-ranked articles/journals) are performed across the entire sample or only considering selected records. **Findings:** Obtained results indicate that there is generally no significant relationship between observed metrics in circulation (except in the case of Mendeley). The same conclusion is reached by looking at 100 prominent individual papers in both categories in terms of overlapping, while the top 100 journals indicate a better overlap. The role of altmetrics is not to predict citation. Societal and academic impacts are rather different categories, and it is reasonable to consider the purpose of both metrics for initiating/enhancing development in emerging markets. **Contribution:** This expanded bibliometric study provides valuable information and orientation for researchers, journals, and academic institutions interested in emerging market growth, evaluation, and financially supporting related research projects.

Keywords: articles on emerging markets, citations, altmetrics, Web of Science (WoS), Altmetric.com, PlumX

JEL Classification: A23, I23

1. Introduction

Emerging markets make a lot of the world economy, even 42 percent of the global GDP and 55 percent of the world population (Cavusgil, 2021). The following countries initially constitute emerging markets: Brazil, Russia, India, and China (O'Neill, 2001), while the acronym BRICS also includes South Africa (Westra, 2017). Depending on the source, emerging market economies comprise many other countries (e.g., Mexico, Turkey, etc.). Tending to become developed economies, they are on a 'seesaw' where fast growth is on one side and high risks on the other. Emerging markets present interdisciplinary research fields (Sudhir et al., 2015) and topics of interest of the general public (including, for example, potential investors, governments, companies, media, etc.).

Bibliometric analysis of articles that deal with emerging-market themes can provide feedback information primarily in terms of channels and frequency of their past usage among scientists and the broader population. Therefore, this activity potentially can contribute to cognition regarding whether and to which extent scien-

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tific efforts influence driving changes. However, it is questionable whether and how the social value of research can be correctly perceived. Some of the open issues are non-standardised methods for measuring social impact (Tahamtan & Bornmann, 2020), initially unequal exposure of papers (for example, because of the Matthew effect – Drivas & Kremmydas, 2020), the way of interpreting bibliometric data (Szomszor et al., 2021).

In traditional bibliometrics, researchers are at the point of confrontations of the following activities that have become part of academic life (Figure 1a): researchers face pressure to publish their work (the so-called "publish or perish" practice is a reality – Grimes et al., 2018); their publications pass academic evaluation through the number of acquired citations; all previously mentioned forces expressed quantification of research results. These imposed activities create constraints for researchers. Figure 1b shows the position of a researcher in measuring alternative metrics. As papers are available in the digital form today, their distribution, and therefore usage, go online. This opportunity allows daily tracking of public attention and alternative metrics – known under the umbrella term 'altmetrics' (Haustein, 2016; Tunger et al., 2018). Researchers are encouraged to post their results on academic networks (e.g., ORCID, Publons, ResearchGate, etc.) to make them more visible. Numerous social media platforms enable their users to share papers, comment on them, and discuss them. However, the potential benefits of new metrics (i.e., altmetrics) and their relationship with citations are not clear (Barthel et al., 2015; Costas et al., 2015).

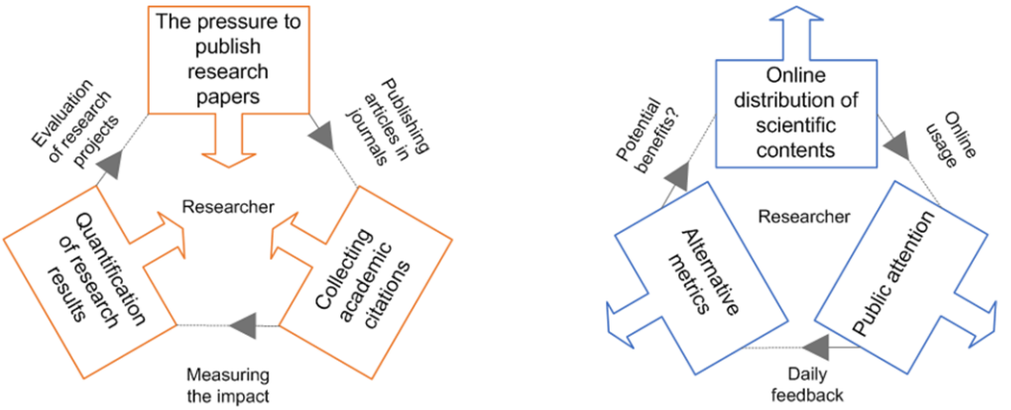

Figure 1: Position of a researcher: 1a. Traditional metrics; 1b. Alternative metrics

The task of this research is to determine relations between citations and altmetrics in the literature of emerging markets:

- Can alternative metrics successfully predict article citations? The potential possibility of evaluating research projects based on altmetric indicators is significant for early-stage projects that do not yet have a chance to validate results through the academic community's citations.
- Do scientific and public attention converge in terms of overlapping top-ranked articles/journals? The answer provides an insight into the possibilities of scientists and the crowd to jointly initiate changes to achieve sustainable development in emerging economies.

After introducing concepts of traditional bibliometrics and altmetrics (section 2), the paper describes the research method conducted to determine if there is a statistically significant correlation between traditional and non-traditional metrics in relevant articles on emerging markets (section 3). According to both metrics, section 4 contains obtained results – correlations and percentages of overlapping top articles/journals. The obtained results are discussed compared to other similar studies (section 5), while the conclusion is in section 6.

2. Traditional Bibliometrics and Altmetrics

Prior to introducing the research papers' metrics, we first need to formulate the related terminology and criteria consistently. Issues persist when distinguishing the following terms in the literature: outcome, output, impact, and effects of research papers (Bornmann & Haunschild, 2019). Figure 2 defines these terms as well the whole process from the outcome to effects.

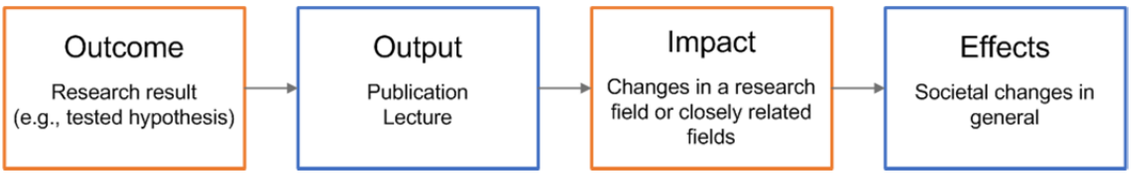

Figure 2: Measuring what? Outcome, output, impact, and effects of research papers (according to Bornmann & Haunschild, 2019)

As an established measure of academic impact, citations only partially reflect research quality through the impact (Martin & Irvine, 1983; Bornmann & Haunschild, 2019) and relevance (Aksnes et al., 2019) in the scientific community, while they do not cover research importance and correctness. Besides, the connection between societal impact and the quality of research is less clear. Therefore, measuring the quality of research papers is an additional problem.

2.1 Traditional bibliometrics

Traditional bibliometrics focuses on citation-based metrics for ranking journals by their 2-years impact factor (IF). Other bibliometric indicators are also in use, such as 5-year IF, immediacy index, article influence score, source normalised impact per paper (SNIP), and SCImago journal rank (SJR) (Subochev et al., 2018). Further, there is the *h*-index for ranking scientists/researchers/academics and other author-based metrics (Da Silva & Dobránszki, 2018). Ranking academic institutions, such as universities (Johnes, 2018), is conventional, for which highly cited researchers are one of the indicators for academic ranking (Liu & Cheng, 2005). Traditional bibliometrics has established usage and recognised advantages. For example, according to Karanatsiou et al. (2017), it shows the actual impact and has a strong theoretical background. However, there are also some shortcomings:

- Citation-based indicators reflect academic impact while funding agencies are interested in more extensive types of effects (for example, patent metrics) – Thelwall et al. (2016).
- Traditional bibliometrics imply long-time citation accumulation and, therefore, several years for evaluation (Priem & Hemminger, 2010; Thelwall et al., 2016).
- There are biases in different aspects of self- and team-citation (Ioannidis, 2015) and the need for fair ranking schemes for multi-author publications (Vavryčuk, 2018).
- There are dependencies from citation databases (e.g., WoS, Google Scholar, Scopus, Microsoft Academic) that may provide different coverage via citations (Martín-Martín et al., 2020) and different results (i.e., number of citations) for the same publication. This paper uses the WoS database for measuring citations, as many other studies (for example, Fang et al., 2020; Hou et al., 2020; Heydari et al., 2019; Banshal et al., 2018). Verily, WoS is one of the prime scientific citation searches and platforms with a long tradition (Li et al., 2018).
- It is questionable whether highly cited papers guarantee remarkable scientific contributions, as we tend to expect. Citation behaviour can also be motivated by non-scientific reasons (Bornmann & Daniel, 2008). Moreover, papers can have high citation scores on account of criticism or useful reviews instead of state-of-the-art research (Thelwall et al., 2016).
- There are systematic biases in the sense of differing citation norms for different fields, so it is advisable to compare only articles from the same area (and preferably the same year) if normalisation is not an option (Thelwall et al., 2016).
- Citations are related to subsequent research project evaluations, and they are not applicable in the project's early phases. Therefore, additional metrics are required.

2.2 Altmetrics

Altmetrics are alternative metrics that, depending on a provider, count the number of mentions (e.g., policy sources, news, blogs), social media activities, captures from reference managers and social bookmarking, etc. Altmetric providers can include data about citations (for example, Altmetric.com provides 'Dimensions' which do not contribute to the Altmetric Attention Score, while PlumX observes several citation databases and takes the maximum recorded value for the number of citations). Each provider has some specifics. Altmetric.com has defined weighting coefficients for each type of mention, as well as provides demographic data. PlumX does not give a final score but tracks separate metrics by categories (also, it includes the 'Usage' category). Crossref Event Data (CED) collects events from a specific list of data sources. Detailed information about these three providers' differences by individual sources or separate metrics leads to con-

clusions that there is a seriously higher number of articles mentioned on Twitter, according to Altmetric.com, in comparison with CED and PlumX (Ortega, 2018). Problems of heterogeneous sources, dependencies from a data provider, and the quality of provided altmetric data are notable (Haustein, 2016). Some authors express concerns about various research metrics without standardised measurement rules (e.g., Buttlier & Buder, 2017).

Altmetrics measure research impact per day, not per year (Barnes, 2015), since altmetric providers collect data online in real-time and use automated algorithms to process them. Instant feedback is an advantage in comparison with citations. Altmetrics attract the general population's attention (Banshal et al., 2018) and record public reaction or research exposure (Barnes, 2015). According to the present idea of collective intelligence (Barnes, 2015), it is reasonable to assume that research people think necessary will draw much more attention.

3. Research Method

The starting point for the research is the WoS database. A search of the database on the topic "emerging markets" was carried out with the following filters, aiming at incorporating more relevant scientific literature: document type – articles; Web of Science Index – Social Sciences Citation Index, Science Citation Index Expanded. Obtained WoS records exported on 11 November 2019 include articles from 1996 – 2019. During the next couple of weeks, the author eked out the base with additional data.

The initial article database is expanded with altmetric data either from Altmetric.com or PlumX, gathering from detailed pages, using Digital Object Identifier (DOI) numbers. From 5192 initial records, the database was reduced to 3996 records (because of the elimination of articles without or with incorrect DOI numbers and articles for which a publisher does not provide/display altmetric data on its pages).

The number of articles by providers is the following:

- Altmetric.com – 2042 articles;
- PlumX – 1954 articles.

Table 1 shows the top 10 journals (of the total 650) by the number of articles/records in the database. They together make 26.62% of the total number of records.

Table 1: Top 10 journals by the number of articles

Journal Name	Number of Articles	Percentage Number of Articles
Emerging Markets Finance and Trade	195	4.88%
Emerging Markets Review	144	3.60%
Journal of International Money and Finance	138	3.45%
Journal of Banking & Finance	108	2.70%
Physica A-Statistical Mechanics and Its Applications	99	2.48%
Journal of Business Research	94	2.35%
International Business Review	80	2.00%
Journal of International Business Studies	73	1.83%
Research in International Business and Finance	70	1.75%
Applied Economics	63	1.58%
Total	**1,064**	**26.62%**

Further analyses use the number of citations and numbers of unified altmetric data for each article. Namely, data for each common indicator from both altmetric providers, Altmetric.com and PlumX, were unified in single columns. Therefore, the study observes the following parameters for each article in the sample:

- WoS number of citations – the number of citations according to the WoS database;
- Mentions – the sum of mentions by all recorded sources (Figure 3 shows the sources). Since the providers have different categories of mentions, here all individual mentions by all sources are summed up without previous weighting;
- Twitter – the number of social media interactions from Twitter;
- Facebook – the number of social media interactions from Facebook;
- Mendeley – the number of Mendeley captures;
- CiteULike – the number of CiteULike captures.

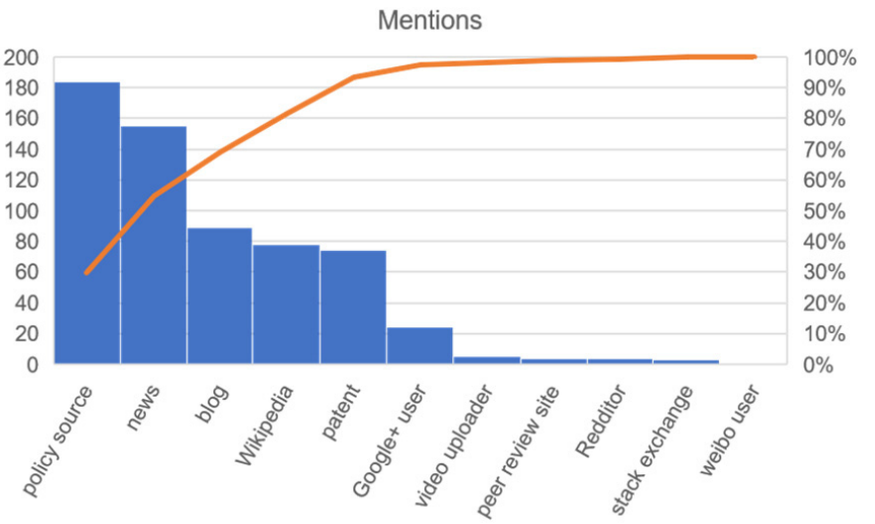

Figure 3: Representation of Mentions by sources for all articles

The Altmetric Attention Score, introduced by Altmetric.com, which weights mention sources and social media sources, is not used in analyses because of the inability to compare with PlumX, which does not use weighting.

4. Results

Table 2 shows only statistically significant results for two criteria: all records and, conditionally speaking, only highly cited articles in the sample with the number of citations higher or equal to 50[1]. There are moderate correlations between the WoS number of citations and Mendeley in both criteria (in the latter criterion, it is more significant than in the former). Other captured correlations are very weak (between WoS number of citations and Mentions/CiteULike) for the former criterion and weak (between WoS number of citations and CiteULike) for the latter criterion. Table 2 does not include correlations that are not statistically significant in this research, i.e., between WoS number of citations and Twitter/Facebook for the former criterion, and between WoS number of citations and Mentions/Twitter/Facebook for the latter criterion (i.e., selected articles).

Table 2: Correlations between WoS number of citations and some altmetric indicators

Criterion	N	Relationship between		Pearson Correlation	Strength
All records	3996	WoS number of citations	Mendeley	0.467**	moderate
			Mentions	0.176**	very weak
			CiteULike	0.152**	very weak
WoS number of citations ≥ 50	442	WoS number of citations	Mendeley	0.562**	moderate
			CiteULike	0.203**	weak

**. *Correlation is significant at the 0.01 level (2-tailed).*

Other results show a weak correlation between Twitter and Mendeley for all records (it equals 0.204) and a moderate correlation between Twitter and Mentions for selected articles (it equals 0.439). The relationship between Mendeley and CiteUlike is very week, and it equals 0.112/0.160 for the former/latter criterion, respectively.

[1] WoS number of citations ≥ 50 is also used in other fields – e.g., for quantitative analyses in disability-related fields (Ahmed et al., 2016). Similarly, several hydrology journals have approximately 10% highly cited articles with citations more numerous than 50 for ten years of observation (Clark & Hanson, 2017). In this paper, the percentage is similar – it equals 11.06% for citations ≥ 50.

Table 3 shows the top 10 journals' overlapping by the sum of WoS number of citations and the top 10 journals by cumulative altmetric indicator – the sum of Mentions, Twitter, and Facebook, without Mendeley and CiteULike[2]. There are three journals (shaded in Table 3) that overlap in both categories, while the top 100 journals show 56% of the same overlapping.

Table 3 : Overlapping of top 10 journals

Top 10 journals by citations		Top 10 journals by cumulative altmetric indicator	
Journal Name	**∑ WoS number of citations**	**Journal Name**	**∑ (Mentions + Twitter + Facebook)**
Journal of Financial Economics	7683	Emerging Markets Review*	1029
Journal of Finance	4977	Journal of International Financial Markets Institutions & Money	572
Journal of International Business Studies*	4316	Research in International Business and Finance	419
Journal of Banking & Finance*	4029	Journal of World Business	406
Strategic Management Journal	3821	Journal of Business Research*	397
Journal of International Economics	3574	International Review of Financial Analysis	386
Journal of International Money and Finance*	3450	Journal of International Money and Finance*	342
Review of Financial Studies	3078	Journal of International Economics	305
Physica A-Statistical Mechanics and Its Applications*	2266	Bulletin of Indonesian Economic Studies	282
Journal of World Business	2113	Geoforum	233

* Top 10 journal on the basis of the number of articles in the database

Regarding the overlapping of individual articles, only two articles overlap between the top 100 according to the number of citations and the top 100 according to the cumulative altmetric indicator. shows the dependence of the overlapping of articles on a top selected part of the sample (the overlap for all records equals 100%).

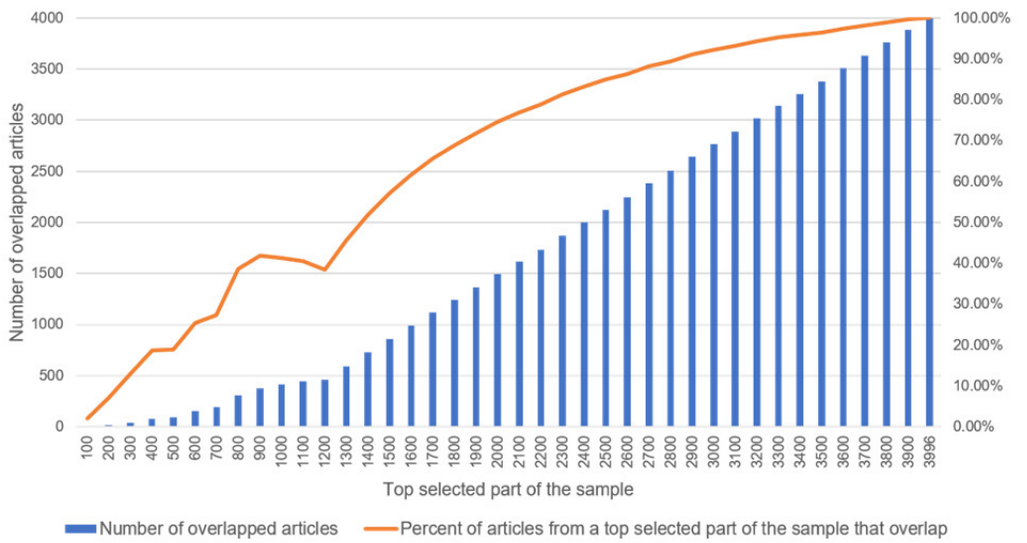

Figure 4: Dependence of overlapping of articles on a top selected part of the sample

[2] Mendeley and CiteULike do not participate in the cumulative altmetric indicator in this paper in the same way as they do not participate in the Altmetric Attention Score. The difference is that the weighting of individual altmetric indicators is not done here as it is done by Altmetric.com to encompass the data from PlumX, where no weighting is used.

5. Discussion

Policy sources are the most representative mentions in the research field about emerging markets, followed by news, blogs, Wikipedia, and patents. This result suggests that the topic matches the five most weighted sources listed according to Altmetric.com (2021). In comparison with the result of less than 0.5% of the WoS indexed papers belonging to different WoS subject categories mentioned in policy sources (i.e., policy-related documents) at least once (Haunschild & Bornmann, 2017), this percent is higher in this study. It equals 3.35% in the field of emerging markets.

The obtained results do not show statistically significant correlations between the WoS number of citations and the altmetric indicators in general. This especially goes for social media sources (Facebook and Twitter). Mentions and CiteULike show very weak correlations with the WoS number of citations, while only Mendeley shows a moderate correlation (0.467). In observing only selected papers (with at least 50 citations), correlation with Mendeley is moderate (0.562) while it is weak with CiteULike. Therefore, it is not advisable to use altmetrics as non-traditional metrics to predict citations. Altmetrics are an imperfect tool in the sense of foretelling future citations (Barnes, 2015). Also, Costas et al. (2015) conclude that "altmetrics do not reflect the same concept of impact as citations" (p. 2003). Altmetrics rather give evidence about the public interest or attention (Tahamtan & Bornmann, 2020).

The positive result in Mendeley's case is not accidental – Mendeley reader counts for journal articles represent their useful early impact indicators (Thelwall, 2018). Bornmann and Haunschild (2018a) point out that "citation-based metrics and readership counts are significantly more related to quality, than tweets" (p. 1/12). Tweets do not show a positive result in this study, although there is a claim that those collected in the first three days after article publishing can predict highly cited articles (Eysenbach, 2011).

The top 100 articles, according to the WoS number of citations and the cumulative altmetric indicator, show minimal overlapping of only two articles (2%). Similar disjoint results are provided by Banshal et al. (2018), who have compared the top 100 Altmetric 2016 papers and the top 100 WoS citation papers – only 12 articles overlap. It should be remembered that 48% of the top 100 Altmetric 2016 papers come from medical literature, while this paper deals with different research field. The percentage of overlapping top-ranked journals according to the WoS number of citations and the cumulative altmetric indicator in this paper is higher – it equals 30% (in the top 10) and 56% (in the top 100).

Conclusion

The paper presents an original and expanded bibliometrics study conducted in a specific field, i.e., emerging markets. It includes relevant scientific articles and data from three sources: one citation database and two altmetric providers. The general conclusion is that the role of altmetrics is not to predict citations. Therefore, altmetrics are not a reliable indicator for the early evaluation of research projects in this field. Besides, scientific and public preferences do not converge in the top-ranked articles on emerging markets, while their interests in observing top journals are better matched.

Generally, the academic impact is closer to the quality of publications than the societal impact if we represent them through altmetrics, i.e., "the relationship of altmetrics and quality is not as strong as the relationship between citations and quality" (Bornmann & Haunschild, 2018b, p.1010). Furthermore, altmetric potentials are in linking research literature and actions in the society. Still, altmetrics may capture some different aspects of societal impact, the so-called "unknown attention" (Bornmann et al., 2019). The positive correlation of citations and academic readers (such as Mendeley) is not surprising because researchers who write articles use them. Simultaneously, the subject of societal mentions is not restricted to only scientific literature (and not only directly). Unofficial contents rather come into sight of the wider population, which is not inclined to reference.

Altmetrics and citations are rather more complementary than similar measures, so it is correct that altimetric providers show both data on their pages, providing a complete picture of scientific and public attention, which does not overlap. The different natures of these metrics also imply their different usage. In the context of funding research projects, it is not advisable to use altmetrics for their evaluation. Altmetrics may have different roles that need to be investigated in the future, for example, in crowdfunding (Morell et al., 2020). As one way of alternative funding in emerging markets, this activity is rising (Cumming & Zhang, 2016). It relies on attracting public attention for research work since funders are interested in a "broader impact" (Altmetric YouTube Channel, 2015). In general, activities that would unite the scientific and 'non-scientific' efforts and knowledge are desirable and necessary for the further growth of emerging markets (e.g., in the domain of open innovations – Kafouros & Forsans, 2012). Other situations may include overcoming ongoing crises (e.g., consequences of COVID-19 on emerging markets, discussed by Arellano et al., 2020; Uddin et al., 2020; Topcu & Gulal, 2020; etc.).

One limitation of this study is the representation of many zeros in the data, without using any approach to overcome this data flaw. One such technique is, for example, the Mantel-Haenszel quotient indicator (Bornmann & Haunschild, 2018b). Other limitations include work with altmetric data that can change daily and the existence of 'unequal' metrics among used providers. The relationship between studied metrics and preprint publishing is one of the possible research directions for future research.

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