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A comparison of university performance scores and ranks by MNCS and FSS

Giovanni Abramo [a,*], Ciriaco Andrea D'Angelo [a,b]

[a] Laboratory for Studies of Research and Technology Transfer, Institute for System Analysis and Computer Science (IASI-CNR), National Research Council of Italy, Via dei Taurini 19, 00185 Rome, Italy
[b] Department of Engineering and Management, University of Rome "Tor Vergata", Via del Politecnico 1, 00133 Rome, Italy

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ABSTRACT

In a previous article of ours, we explained the reasons why the MNCS and all similar per-publication citation indicators should not be used to measure research performance, whereas efficiency indicators (output to input) such as the FSS are valid indicators of performance. The problem frequently indicated in measuring efficiency indicators lies in the availability of input data. If we accept that such data are inaccessible, and instead resort to per-publication citation indicators, the question arises as to what extent institution performance rankings by MNCS are different from those by FSS (and so what effects such results could have on policy-makers, managers and other users of the rankings). Contrasting the 2008–2012 performance by MNCS and FSS of Italian universities in the Sciences, we try to answer that question at field, discipline, and overall university level. We present the descriptive statistics of the shifts in rank, and the correlations of both scores and ranks. The analysis reveals strong correlations in many fields but weak correlations in others. The extent of rank shifts is never negligible: a number of universities shift from top to non-top quartile ranks.

1. Introduction

The increasing application of New Public Management to the academic sector, with emphasis on quasi-market competition, efficiency and performance audit practices (Schubert, 2009), has led to a situation of an influential and growing community of scientometricians, engaged in intense search for ever better research performance indicators. In recent years there has been a proliferation of new indicators and variants or extensions of old ones. At the same time, we witnessed a surge of international and national research performance rankings. These are based on different indicators and methods, and seem often to show contrasting results. While the ostensible aim was to support the policy makers and the managers of research institutions in making evidence-based decisions, the outcome is that of bewilderment: often the policy maker cannot discern the appropriate and valid methods to measure research performance, or the ranking on which to base their decisions. In our view, the moment has arrived for scientometricians to take responsibility; to converge on a synthesis stating which are the more appropriate indicators of performance.

In a recent work of ours (Abramo & D'Angelo, 2016a), we try to explain why the world-famous Leiden group's Mean Normalized Citation Score or MNCS (Waltman, Van Eck, Van Leeuwen, Visser, & Van Raan, 2011), cannot be considered

* Corresponding author.
E-mail addresses: giovanni.abramo@uniroma2.it (G. Abramo), dangelo@dii.uniroma2.it (C.A. D'Angelo).

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a "performance" indicator and, therefore, the university rankings by MNCS are not valid. In the same special section we responded to the comments of eminent scholars in the field, and further argued our position on the matter (Abramo & D'Angelo, 2016b). In short, to us all size-independent indicators based on the ratio to publications are invalid indicators of performance, because research performance cannot be defined as the average impact of output (MNCS). Furthermore, performance (as measured by MNCS) may actually diminish if additional output is cited below average, which is a paradox. Vice versa, size-independent indicators based on the ratio to research input, are more appropriate indicators of performance, since they establish which individuals or research units, under parity of resources, have more or less impact on scientific advancement. Since the very beginning of our research activity in the field of scientometrics (Abramo, D'Angelo, & Pugini, 2008), we have always refrained from the adoption of such well established and already popular indicators as the *h*-index (Hirsch, 2005) and the CPP/FCSm or "old" crown indicator (van Raan, 2005; Moed, De Bruin, & van Leeuwen, 1995), the forerunner of the current MNCS. Instead, we pursued the measurement of efficiency indicators which could allow the ranking of individuals and research units according to a better proxy of their "real" performance, despite all the assumptions and limits embedded in the operationalization of the measurement. The latest versions and the detailed explications of the theory underlying the two indicators that we apply to approximate the measure of labor productivity in research institutions, namely the *Fractional Scientific Strength* (FSS) and the HCAs (highly cited articles) per scientist, can be found in Abramo and D'Angelo (2014) and Abramo and D'Angelo (2015b).

The limits of the *h*-index have been discussed extensively in the literature and there have been numerous attempts to overcome them through *h*-variants (Egghe, 2010; Norris & Oppenheim, 2010; Alonso, Cabrerizo, Herrera-Viedma, & Herrera, 2009). In two previous works of ours, we have measured the differences in university rankings by FSS and h- and g-indexes (Abramo, D'Angelo, & Viel, 2013), as well as at the individual level (Abramo, D'Angelo, & Viel, 2013). In this work we intend to do the same for the MNCS, to see to what extent the university performance scores and ranks by FSS diverge from those by MNCS. We will assess the differences at field, discipline and overall institution level.

By common sense one would expect that in general talented researchers capable to produce high impact publications do also produce a high number of articles. Whereas less talented researchers produce a lower number of publications of lower impact. Leaving aside the few exceptions that prove the rule, several empirical studies confirm that. Abramo, D'Angelo, and Di Costa (2010) demonstrate the existence of a strong correlation between quantity and impact of research production: scientists that are more productive in terms of quantity also achieve higher levels for impact in their research products. Larivière and Costas (2015) show that the higher the number of papers a researcher publishes, the more likely they are amongst the most cited in their domain. van den Besselaar and Sandström (2015) show that researchers producing a high number of papers have significantly higher probability to produce top cited papers. Since FSS embeds both quantity and impact of publications, because of the strong correlation between the two, one would expect a strong correlation between performance scores and ranks by FSS and MNCS. Our findings show that this is more or less true at discipline and at the aggregate institution level, although cases of noticeable shifts in ranking are registered.

The manuscript proceeds as follows: in the next section we present the field of observation and methodology adopted; Section 3 reports the results of the comparison; Section 4 provides the conclusions.

2. Data and methods

2.1. Dataset

The dataset of the analysis is based on the 2008–2012 WoS indexed publications authored by professors in the Sciences of all Italian universities. Citations are observed at October, 2015. The Italian Ministry of Education, Universities and Research (MIUR) recognizes a total of 96 universities authorized to grant legally recognized degrees. In Italy there are no "teaching-only" universities, as all professors are required to carry out both research and teaching, in keeping with the Humboldtian philosophy of higher education. Each professor is officially classified in one and only one research field. There are a total of 370 such fields (named scientific disciplinary sectors, or SDS,[1]), grouped into 14 disciplines (named university disciplinary areas, or UDAs). For reasons of robustness, we examine only the nine UDAs in the Sciences[2] including a total of 192 SDSs, whereby publications in indexed journals is the prevalent mode for output codification. Furthermore, again for robustness, we exclude all professors who have been on staff less than three years in the observed period (Abramo, D'Angelo, & Cicero, 2012).

Data on academics are extracted from a database maintained at the central level by the MIUR,[3] indexing the name, academic rank, affiliation, and the SDS of each professor. Publication data are drawn from the Italian Observatory of Public Research (ORP), a database developed and maintained by the authors and derived under license from the Web of Science

[1] The complete list is on http://attiministeriali.miur.it/UserFiles/115.htm, last accessed 05/07/2016.
[2] Mathematics and computer sciences; Physics; Chemistry; Earth sciences; Biology; Medicine; Agricultural and veterinary sciences; Civil engineering; Industrial and information engineering.
[3] http://cercauniversita.cineca.it/php5/docenti/cerca.php, last accessed 05/07/2016.

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