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Journal of Informetrics

journal homepage: www.elsevier.com/locate/joi

Regular article

Perverse effects of output-based research funding? Butler's Australian case revisited

Peter van den Besselaar^{a,*}, Ulf Heyman^b, Ulf Sandström^c^a Network Institute, Vrije Universiteit Amsterdam, Amsterdam, The Netherlands^b Uppsala University, Uppsala, Sweden^c KTH Royal Institute of Technology, Stockholm, Sweden

ARTICLE INFO

Article history:

Available online 15 July 2017

ABSTRACT

More than ten years ago, Linda Butler (2003a) published a well-cited article claiming that the Australian science policy in the early 1990s made a mistake by introducing output based funding. According to Butler, the policy stimulated researchers to publish more but at the same time less good papers, resulting in lower total impact of Australian research compared to other countries. We redo and extend the analysis using longer time series, and show that Butler's main conclusions are not correct. We conclude in this paper (i) that the currently available data reject Butler's claim that "journal publication productivity has increased significantly... but its impact has declined", and (ii) that it is hard to find such evidence also with a reconstruction of her data. On the contrary, after implementing evaluation systems and performance based funding, Australia not only improved its share of research output but also increased research quality, implying that total impact was greatly increased. Our findings show that if output based research funding has an effect on research quality, it is positive and not negative. This finding has implications for the discussions about research evaluation and about assumed perverse effects of incentives, as in those debates the Australian case plays a major role.

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1. Introduction

More than ten years ago, Linda Butler (2003a) published a well-cited article analyzing the effects of the increased emphasis on research evaluation and of the introduction of output based funding in the Australian academic research system during the first half of the 1990s. The science policy during that time included university research funding that was partially based on the number of publications. According to Butler, this policy stimulated researchers to publish more but at the same time less good papers. To illustrate this, she showed that Australian number of papers was increasing, as was the share in world production of papers, but that the relative citation impact of those publications did not increase. As the same indicators for other countries were increasing, Butler concluded that the Australian knowledge production was losing quality. She also used the changing distribution of publications over quartiles of the journal impact factor (JIF) to show that the increase of the number of papers mainly occurred in low impact journals (Butler, 2002).

* Corresponding author.

E-mail addresses: p.a.a.vanden.besselaar@vu.nl (P. van den Besselaar), ulf.heyman@uadm.uu.se (U. Heyman), ulf.sandstrom@indek.kth.se (U. Sandström).

Butler suggested two behavioral mechanisms to explain this finding: “Increased system-wide and institutional performance evaluation based on aggregate output measures appears to be altering researchers’ publication habits” (Butler, 2003a, p. 154). Firstly, she claimed that the new policy was stimulating Australian researchers to select on average lower level journals for their increased output. “When this element (of output based funding) was incorporated into the funding formulae in 1995, universities and researchers were quick to calculate the ‘value’ of a publication”, and with “no differentiation between the quality or impact of the publications, there is little incentive to strive for placement in a prestigious journal” (Butler, 2002, p. 877). Secondly, also because of the new output oriented policy, one would “expect ‘publication inflation’ from a performance-based system where aggregate publication counts are a key component” (Butler, 2003a, p. 154). The concept of publication inflation was introduced by researchers at the Science Policy Research Unit (SPRU) in Brighton and hinted at phenomena such as “salami publishing and game playing”. According to Butler, academics accepted a situation with growing output, but an output appearing in lower impact journals (Butler, 2003a, p. 154): “In consequence, journal publication productivity has increased significantly in the last decade, but its impact has declined” (Butler, 2003a, p. 143), a conclusion that has been cited many times since. The policy lesson was also obvious, as “a more detailed examination of the data reveals that Australia’s RCI continues to decline, and raises important questions on the wisdom of a policy that rewards quantity, with scant regard to quality” (Butler, 2003a, p. 143).

The question, however, is whether these observations and conclusions are in accordance with available data and present knowledge. There is not much direct evidence available for behavioral reactions on ‘perverse incentives’, or for ‘salami slicing’ practices, whereas research does find high commitment and motivation of researchers (Van der Weijden, Belder, van Arensbergen, & van den Besselaar, 2015) and a positive correlation between commitment, motivation and productivity (Pelz & Andrews, 1966). Other studies indicate that, on average, the more papers a researcher publishes, the higher the proportion of these papers that are amongst the most cited (Van den Besselaar & Sandström, 2015; Sandström & van den Besselaar, 2016). This holds more clearly for established researchers than for early career researchers (Larivière & Costas, 2015). The positive relation between number of papers and proportion of highly cited papers is in line with theories about scientific creativity (Simonton, 2004).

Butler’s argument has been repeated many times (e.g. Geuna & Martin, 2003; Hicks, 2009; OECD, 2010; Stephan, 2012; Hicks et al., 2015), and has become common knowledge in science policy studies. For example, Schneider, Aagaard, and Bloch (2016) use the Australian case as a frame of reference for their study of the effects of the so-called ‘Norwegian model’. Especially concerning government funding of universities, Butler’s papers have been very influential. In view of the scarce behavioral evidence and the quite short time series available to Butler, it seems important to take a fresh look at the Australian policy intervention and the effects of it.

Doing the analysis today has several advantages viz. Butler’s study, as citations counts will be rather stable, the database has been improved, better indicators have developed, and the time since changes in the funding system is long enough to be sure that possible changes in publication numbers and quality can be detected. Our aim is thus not to replicate Butler’s study, but to reanalyze the effect of the changes in the funding system in Australia during the first half of the nineties.

We conclude in this paper (i) that the currently available data reject Butler’s claim that “journal publication productivity has increased significantly in the last decade, but its impact has declined” (Butler, 2003a) and (ii) that it is hard to find evidence for this also with a reconstruction of her data. Indeed, our evidence suggests that the average impact per publication has increased after emphasis on evaluation became stronger and performance based funding was introduced. So Australia improved its relative share of research output without losing quality and thus the total impact was greatly increased.

It may be useful to clarify here the use of citation impact as proxy for scholarly quality, as this is disputed in the literature (e.g., Martin & Irvine, 1983, p. 67–71; MacRoberts & MacRoberts, 1989). It is important to keep in mind that this criticism mainly holds for the use of bibliometric indicators at the individual level (Van Raan, 1996). At the individual level, more dimensions of scholarly quality than citation impact play a role (Van Arensbergen, Van der Weijden, & van den Besselaar, 2014), such as *independence*, *originality*, and *creativity* – dimensions that have to a large extent been neglected by bibliometricians. Elsewhere we have taken up this challenge (Van den Besselaar, Sandström, & van der Weijden, 2012). Finally, also other quality dimensions are relevant for which indicators can be developed, such as societal impact (de Jong, Barker, Cox, Sveinsdottir, & Van den Besselaar, 2014; Van der Weijden, Verbree, & van den Besselaar, 2012). However, it is also well known that if one uses data on larger groups (teams, universities, or countries), citations are a fairly reliable and valid proxy for scholarly quality (e.g. Narin, 1976; Roche & Smith, 1978; Nederhof & van Raan, 1993; Phelan, 1999), and this is the way we use citation impact in this paper – as did Butler (2003a).

2. The Australian incentive system in the 1990s

Since long, Australia has a funding system consisting of block grants and competitive research grants via research agencies. Core funding (block grants) became in 1990 dependent on a “Research Quantum” (RQ) based on success in acquiring grants, i.e. research earnings. This funding model later developed as student numbers and publication components were added to the formula. In 1995 it was for the first time announced that a new Composite Index (CI) would be introduced (Butler, 2002, 2003a, 2003b, 2004) which also included publication counts. It should be noted that most universities used internal performance based systems for the distribution of research funds, which makes it hard to pinpoint both the time and the strength of the intervention. The CI consisted of external earnings and of output-related indicators: scholarly publications by staff, and the number of higher degrees granted. The weights given to the different elements varied over time, e.g. the

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