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The career effects of scandal: Evidence from scientific retractions☆

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ABSTRACT

We investigate how the scientific community's perception of a scientist's prior work changes when one of his articles is retracted. Relative to non-retracted control authors, faculty members who experience a retraction see the citation rate to their earlier, non-retracted articles drop by 10% on average, consistent with the Bayesian intuition that the market inferred their work was mediocre all along. We then investigate whether the eminence of the retracted author and the cause of the retraction (fraud vs. mistake) shape the magnitude of the penalty. We find that eminent scientists are more harshly penalized than their less distinguished peers in the wake of a retraction, but only in cases involving fraud or misconduct. When the retraction event had its source in "honest mistakes," we find no evidence of differential stigma between high- and low-status faculty members.

1. Introduction

In July 1987 Charles Glueck, a leading scientist known for his investigations into the role of cholesterol in heart disease, was censured by the National Institutes of Health (NIH) for serious scientific misconduct in a study he published in *Pediatrics*, a major medical journal (Glueck et al., 1986). At the time the article was retracted, Dr. Glueck was the author of 200 publications that had garnered more than 10,000 citations. The scandal was well-publicized, including two articles in the New York Times calling into question the ability of peer reviewers to root out misconduct in scientific research more generally. Glueck's fall from grace was swift—he had to resign his post from the University of Cincinnati College of Medicine—but also far from complete: he found employment as the Medical Director of The Jewish Hospital Cholesterol Center in Cincinnati, and was still an active researcher as of 2014, though he never again received funding from NIH.

Across many economic settings, including the realms of entertainment, sports, and the upper echelons of the corporate world, *scandal* looms as one of the primary mechanisms through which the mighty are often brought low. The consequences of scandalous revelations are especially important in the scientific community, where reputation functions like a currency (Partha and David, 1994). However, the efficiency of the scientific reward system is predicated upon the community's ability to separate truth from falsehood, to strike inaccuracies from the scientific record, and to dole out reputational punishment in the wake of errors or misconduct (Budd et al., 1998; Lacetera and Zirulia, 2011; Fang et al., 2012; Furman et al., 2012; Azoulay et al., 2015). Which scientists are most vulnerable to these punishments? How does the nature of an infraction and the prominence of the scientist moderate the effect of scandal on scientific reputation? Because scandal is at its core an informational phenomenon, we study the professional fate of scientists whose transgressions are suddenly publicized—to paraphrase the succinct definition of scandal provided by Adut (2005).

The reigning theoretical paradigm to assess the effects of the revelation of information is Bayesian updating. When the "market" (the scientific community) observes the release of negative information, it might infer that the agent (in this case, a scientist) was mediocre all along, therefore discounting the work that he produced in the past. In line with this paradigm, we develop a theoretical model that incorporates two key factors in the community's assessment of a scandal: (i) the agent's prominence at the time of the negative revelation, and (ii) the informational content of the disclosure itself. Our model predicts that more prominent scientists will suffer greater reputation loss than less prominent authors following disclosures of misconduct, but not following disclosures of "honest mistakes."

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To address these issues empirically, we turn to the setting of scientific retractions. We start from a list of biomedical research articles retracted during a period that spans the years 1980 to 2009. We carefully match the authors of these publications to the Faculty Roster of the Association of American Medical Colleges (AAMC), a comprehensive panel dataset recording the career histories of U.S. academic biomedical researchers. This generates a list 376 US-based faculty with at least one retracted publication (retracted authors) for whom we assemble a curated history of publications, NIH grants, and citations. Our novel multi-level panel dataset links individual faculty members associated with retraction events together with their prior, un-retracted publication output. We proceed in a symmetric fashion to produce a sample of articles linked to 759 control authors who were not embroiled in retraction scandals, but published articles in the same journals where the retraction events occurred.[1]

Armed with these data, we analyze the impact of retraction events on the rate of citation received by non-retracted articles published prior to the retraction in a difference-in-differences framework. Analyzing citations to prior work, rather than citations to articles published after the retraction event, is a key feature of our empirical strategy. Following a negative reputation shock, scientists might adjust their level of effort or face new production constraints (*e.g.*, reduced funding opportunities). Focusing on unretracted prior work allows us to attribute any shift in citation patterns to the negative reputation shock, rather than to changes in production inputs.

This type of analysis may, however, confound any citation penalty suffered by a specific retracted author with the broader consequences of the scientific community abandoning a research field altogether. Significant spillover effects of retractions on the evolution of research fields were documented by Azoulay et al. (2015), who examined the impact of retractions on the citation of papers in the same field by non-overlapping authors. In order to isolate the effects of retractions on individuals' reputations and avoid the field-level spillover effects, we focus exclusively on publications by the retracted authors in a different research subfield than the retracted paper. Having filtered out the research field-specific effects, we find that the pre-retraction work of retracted authors suffers a 10% average annual citation penalty following a retraction event, relative to the fate of the articles published by non-retracted control authors.

We then investigate the impact of the authors' reputation at the time of the retraction (whether they belonged to the top quartile of the citation or funding distribution) and of the reasons for the retraction by carefully separating instances of misconduct (including fraud and plagiarism) from instances of mistakes (stemming, for example, from contaminated biological samples or statistical errors). Our results indicate that the cause of the retraction (mistake vs. misconduct) and the scientist's prior reputation interact in very specific ways to shape the magnitude of the community's response. In particular, the work of eminent authors is not penalized more severely than that of less eminent ones in the case of honest mistakes. However, the difference in citation penalty is much more pronounced when retraction events stem from clear-cut cases of scientific misconduct. In these instances, the prior work of retracted authors sees its rate of citation fall by almost 20%.

Jointly, these results show that the penalty levied by the scientific community on a retracted author matches the response of a Bayesian decision maker who holds prior beliefs correlated with the author's prominence in the profession and perceives misconduct cases as more informative signals than honest mistakes. To then assess how well the market is able to parse the "truth" in signals of varying informativeness, we circle back to the joint distribution of author reputations and retraction events. Consistent with the scientific community's beliefs, we find that prior reputation levels are negatively correlated with the incidence of retractions (as it should be if reputation is informative of the true quality of a scientist). Surprisingly, however, cases of misconduct are not relatively more prevalent among low-reputation authors and should not, therefore, carry statistical information. Among possible explanations, this discrepancy in the market's reaction may suggest either an information-processing problem (*i.e.*, the market is unable to filter truth from noise), or an information-acquisition problem (*i.e.*, misconduct cases involving famous authors are much more publicized than all others).

Our study is related to a recent paper by Jin et al. (2013). These authors also study the effect of retraction events on the citations received by prior work from retracted authors, but they focus on the differential penalty suffered by junior and senior authors on the same retracted paper. They find that the senior authors (those in last authorship position) escape mostly unscathed following a retraction, whereas their junior collaborators (typically graduate students of postdoctoral fellows) are often penalized severely, sometimes to the point of seeing their careers brought to an abrupt end. Their results are seemingly at odds with ours, but it is important to note that the variation we exploit exists between authorship teams, rather than within them. In other words, for each retracted article, we usually focus on a single author, typically the principal investigator. In contrast, Jin et al. (2013) compare the citation trajectories of scientists who appeared on the authorship roster of the same retracted publication.[2] Additionally, our study directly investigates how the type of retraction signal (mistake vs. misconduct) moderates reputation penalties, while Jin et al. (2013) aim to remove such variation by discarding self-reported errors from their sample of retraction events.

The manuscript proceeds as follows. The next section summarizes the institutional context of retractions as part of the broader scientific peer review system. Section 3 introduces a Bayesian model to frame the empirical exercise. Section 4 describes the data and the process followed to assemble it. Section 5 presents our empirical strategy and results. Section 6 revisits the model to discuss the extent to which the market's reaction is, in fact, consistent with Bayesian learning. Section 7 briefly concludes.

2. Institutional setting

While the role of scientific research in enabling economic growth has become a truism among economists, scientific progress does not unfold in an institutional vacuum. Rather, the scientific enterprise relies on a set of reinforcing institutions that support individual accountability and reliable knowledge accumulation (Merton, 1973; Partha and David, 1994). In the context of this manuscript, peer review, the allocation of credit through citation, and the retraction system are three fundamental practices worthy of discussion.

One of the central institutions of science is the peer-review system. By submitting scientific articles for independent review by expert peers, the path to publication balances the integrity of published results with the desire to have an adequate pace of discovery. Similarly, the practice of citing relevant prior literature allows scientists to clearly and concisely communicate where there contributions fall within the scientific landscape, while allocating credit to the originators of particular ideas.

Retractions are often the culmination of a process used by journals to alert readers when articles they published in the past should be removed from the scientific literature. They are qualitatively different

[1] We focus on faculty members and exclude technicians, graduate students and postdocs in order to avoid confounding differences in prominence with differences in career stage.

[2] These authors might be graduate students, postdoctoral fellows, staff scientists, or heads of laboratory, though they cannot be separately identified within the constraints of the Jin et al. (2013) empirical exercise. In contrast, we have gathered extensive information about the scientists in our sample, such as demographic characteristics and past productivity. At the time of the retraction event, all of the scientists in our sample are faculty members in a U.S. Medical School.