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A Note on Measuring Normal Science

Abstract:

Petrovich provides an insightful study on Analytic Philosophy (AP) with the intention of determining whether this sub-field of philosophy has been operating within what Kuhn calls a normal science framework. Through a citation analysis, Petrovich concludes that Analytic Philosophy does not exhibit the sort of pattern that we would expect of a field operating in a normal science phase. I take issue with Petrovich's way of measuring normal science. I provide some insight into how we might better measure normal science in future studies.

Key words:

Normal science; citation analysis; Thomas Kuhn; Analytic Philosophy; scientific fields

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A Note on Measuring Normal Science

Petrovich has provided an interesting and insightful study on Analytic Philosophy (AP) with the intention of determining whether this sub-field of philosophy has been operating within what Thomas Kuhn calls a normal science framework (see Kuhn 1962/2012). Through a citation analysis, Petrovich concludes that Analytic Philosophy does not exhibit the sort of pattern that we would expect of a field operating in a normal science phase.

In this brief note I want to take issue with Petrovich's way of measuring normal science. In the process, I hope to provide some insight into how we might better measure normal science in future studies working with the sort of data that Petrovich uses in his study.

In a recent study, Petrovich examines 60 papers, six sets of 10 papers drawn from the leading journals in analytic philosophy, with each set drawn from a decade from the 1950s to the 2000s. His aim is to determine whether Analytic Philosophy, a sub-field of philosophy, is in a state of normal science, as Kuhn conceived of the notion.

Recall, for Kuhn, when a field is in a normal science state, the fundamentals are taken for granted, and those scientists working in the field are able to concentrate on very specific problems (see Kuhn 1962/2012, 19). And scientists working in such a field tend to focus on problems that appear to be easily solved with the conceptual resources supplied by the reigning paradigm or theory (see Kuhn 1962/2012, Chapters III-IV). Indeed, these conditions are what make possible a rapid succession of discoveries, the sort of pattern we associate with the accumulation of knowledge.

Petrovich is interested in determining if there is a trend in the citation patterns that would indicate whether Analytic Philosophy is in a normal science stage. Roughly, he argues that we should expect changes in the nature of the citations made in more recent papers, assuming the field has passed from a pre-paradigm (or, more aptly, pre-normal science) phase to a normal science phase. Specifically, Petrovich says that we should expect more Supporting citations. Supporting citations, Petrovich notes, “are the only ones whose epistemological function is openly *constructive*” (see Petrovich 2018/forthcoming; emphasis in original). Supporting citations are contrasted with (i) state of the art citations, (ii) perfunctory citations, (iii) acknowledgement citations, (iv) critical citations, and (v) documental citations (see Petrovich 2018/forthcoming, Table 1).

On the basis of his findings, Petrovich argues that “we have to be wary of a straightforward assimilation of AP to a classic Kuhnian normal science” (2018/forthcoming). That is, Petrovich does not think there is strong evidence for Analytic Philosophy being in a normal science phase. Petrovich’s assessment is based principally on the following observation. There is a “lack of a well-defined increasing pattern in the occurrence of Supporting citations” (2018/forthcoming). Indeed, as Petrovich shows, there is little change in the percentage of supporting citations across the six decades he examined. As he shows, the mean percentage of Supporting citations ranges from a low of 29.09 % in the 1960s to a high of 45.33 % in the 1970s; the first and last decades have an average of 37.22 or 35.03 %. This, Petrovich suggests, is not the sort of trend we would expect if Analytic Philosophy were in a state of normal science.

I want to take issue with Petrovich’s way of measuring whether a field has entered a normal science phase. Further, I would like to take this opportunity to suggest ways in which we might more effectively measure what it is he seeks to measure.

Petrovich claims that we should expect a larger portion of Supporting citations in papers in a field as it advances in a normal science state. This is not an obvious expectation. In fact, I would like to suggest that what we should expect if a field is advancing into a normal science state is that more recently published papers are citing more recently published literature. That is, a field in which straightforward and cumulative advances are being made should be citing quite recent literature. The advances in the field are so rapid that the older literature is rendered obsolete at a faster rate.[1]

Let us consider my proposal with respect to Petrovich's data set. I want to focus on a comparison of just two papers. My purposes are illustrative. Let us compare a paper from the early period with a paper from the later period. In an effort to keep the value of as many variable fixed as possible, I sought to compare a two papers from the same journal. I chose the *Journal of Philosophy*. And by choosing examples from the 1960s and the 2000s, I was able to choose papers by the same author, David Lewis. This controls for variance in authorship styles. I cannot imagine a more perfect possible world!

So my comparison is between the follow two papers:

LEWIS DK	1968	COUNTERPART THEORY AND QUANTIFIED ...	J. Phil.
LEWIS D	2000	CAUSATION AS INFLUENCE	J. Phil.

The 1968 paper cites 20 sources. They range in age from 1 year old to 40 years old. The mean age of the cited sources is 10.35 years. In comparison, the 2000 paper cites 13 sources. They range in

age from 0 years, published in the same year as Lewis's paper, to 31 years. The mean age of the cited sources is 8.15 years.

So there is some evidence that research in Analytic Philosophy is attending to more recent literature as we approach the present. This provides some evidence that the sub-field is more in line with a normal science phase in 2000 than it was in 1968.

We can see how robust these results are by refining the test. We can attempt to cut out outliers from the data, by excluding the most recently published item and the most dated published item in the citation lists when we calculate how recent the sources cited in these papers are. That is, instead of counting all 20 papers cited in the 1968 paper, we would count only 18 of them. And, with the 2000 paper, we will count only 11 of the 13 papers cited, and not count the two most extreme in terms of age.[2]

Using this method, in the 1968 paper we get a mean age of 9.22 years. In the 2000 paper, we get a mean of 6.82 years. So our findings appear to be robust.

This test I am proposing suggests that there may in fact have been a shift toward a normal science phase in Analytic Philosophy from the 1960s to 2000, contrary to what Petrovich reports.

Clearly, to really establish this conclusion, one would want to examine an aggregate of data, as Petrovich does in his study. I have not done that here. My purpose has been to propose a method for measuring something that Petrovich attempts to measure. I believe that my proposed method provides a better measure of a change in a field toward a normal science phase of research.

There are other concerns with Petrovich's study. It is worth mentioning these briefly. It is far from clear that Analytic Philosophy would constitute a field in the sense that Kuhn was

concerned with in *Structure of Scientific Revolutions*. On Kuhn's view, those researchers working in a field are united by a paradigm or set of paradigms, where "paradigm" denotes a theory. But Analytic Philosophy seems to be identified with particular methods only, not theoretical commitments. For it is widely known that analytic philosophers have very different theoretical accounts of the same phenomena. Further, Kuhn had thought of his model of scientific change as applying to natural scientific fields only. Indeed, he was quite explicit that he did not believe that the dynamics he described in *Structure* fit the development of the social sciences (see Kuhn 1962/2012, xlii). There is nothing wrong with testing whether Kuhn's account has a broader application than he thought. But it should not surprise to find that it does not.

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Notes

- [1] The notion of obsolescence has figured in citation analyses for some time. The notion of citing half-life has been used (see Pravdić and Pekarari 1985). It is a measure of how old the literature is that is cited in articles. It was thought to indicate a number of things, including the quality of a journal, for example (see Pravdić and Pekarari 1985, 233).
- [2] Wray has demonstrated the importance of accounting for the effects of outliers in scientometric studies (Wray 2016).