Explosion or Contraction? Does Psychological Research (Still) Show Exponential Growth?

It is well known that the number of academic articles published each year has a tendency to grow exponentially. However, differences are observed between disciplines, and many have argued that the growth rate has already started to level off. The aim of this study was to investigate whether Psychological research (a) also exhibits exponential growth, (b) is showing signs of a slowdown and (c) displays a different profile to other disciplines. Counts of the number of new publications for (a) Psychology and (b) all disciplines were obtained automatically from Web of Science for every year since 1900. Curve-fitting analysis showed that both counts grew exponentially from 1900 until around 2000, but may have since begun to level off. The percentage of all research classified as Psychological research showed a small but significant decrease from around 3-4% pre-1975 to around 2.4% today.
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It is well known that the number of academic articles published each year has a tendency to grow exponentially (e.g., Price, 1961; Larsen & von Ins, 2010). However, differences are observed between disciplines (e.g., Tague, Beheshti & Rees-Potter, 1981), and many have argued that the growth rate has already started to level off (Larsen & von Ins, 2010), perhaps especially in the social sciences (Egghe & Ravichandra Rao, 1992).

The aim of this study was to investigate whether Psychological research, which arguably straddles the boundary between the social and hard sciences, (a) also exhibits exponential growth, (b) is showing signs of a slowdown and (c) displays a different profile to other disciplines (assessed using a composite “all research” measure).

Method

Annual publication counts were retrieved from Web of Science, using the query “SU=PSYCHOLOGY, PY=[1900, 1901…2012]” for Psychology and “PY=[1900, 1901…2012]” for all research. The search included all languages, all publication types and all databases (Science Citation Index Expanded, Social Sciences Citation Index, Arts & Humanities Citation Index, Conference Proceedings Citation Index-Science, Conference Proceedings Citation Index-Social Science & Humanities). The analysis used the raw number of new articles published each year. Cumulative counts
that begin at an arbitrary cut-off point (e.g., 1900) risk over-estimating growth rates, due to their exclusion of articles published before this date (May, 1966).

**Results**

Figure 1 shows the number of publications for Psychology (lower line) and all research (upper line) on a logarithmic scale. For Psychology, the raw number of new publications per year increased from 382 in 1900 to 48,163 in 2012. The corresponding figures for all-research were 16,097 and 2,045,134 respectively.

With respect to the first question of interest, Psychological research exhibits clear evidence of exponential growth (seen as a straight line on a logarithmic scale), with an exponential function showing an excellent fit to the data (slope = 0.044, SE=0.0008, adjusted $R^2$=0.96, $p<0.001$). However, this overall pattern hides a more nuanced picture, with dips for each of the World Wars and ahead-of-the-curve growth in the 1960s, 1970s and – to a lesser extent – the 1980s.

With respect to the second question, there is indeed some evidence to suggest a slowdown in growth. A 2008 spike notwithstanding, the observed values have remained consistently lower than the values predicted by the logarithmic function since 2001. It is important to put this slowdown into perspective. The number of new Psychology publications each year is still increasing; it is only the *rate of the increase* that shows signs of slowing.
With respect to the third question, the results suggest that, as a discipline, Psychology is entirely typical. The curves for Psychology and all-research are highly similar, at both a micro- and macro-level, and the exponential function fits the all-research data almost identically well (slope = 0.049, SE=0.0008, adjusted $R^2$=0.97, $p<0.001$). The correlation between the annual publication counts for Psychology and all-research is almost perfect ($r=0.99$, $p<0.001$). This, of course, means that the possible slowdown in the rate of increase observed for Psychology holds true for academia in general. There does, however, seem to be a slight decrease in the percentage of all research that constitutes Psychological research (at least as it is classified by Web of Science), down from 3-4% in the period up to 1975 to around 2.4% today.

**Conclusion**

The rate of new academic publications per year, both in Psychology and across all disciplines, has historically shown exponential growth, but this growth rate may now be slowing. An alternative possibility is that academic outputs are still increasing at an exponential rate, but that the proportion of those outputs included in online indices is falling. Although recent years have probably seen an increase in the number of non-indexed publications (e.g., some open-access journals and websites), this relatively small phenomenon seems unlikely to account for the apparent slowdown in growth observed since 2001. Indeed, given that the current trend is towards electronic- and away from paper-based publication, one could easily make the argument that the proportion of all outputs recorded is more likely to be on the increase. Finally, it is important to emphasize that although the rate of increase in Psychology (and all-
discipline) publications may be slowing, there is every reason to believe that the raw number of new outputs will continue to grow year-on-year for the foreseeable future.

References


Larsen, P. O., & von Ins, M. (2010). The rate of growth in scientific publication and the decline in coverage provided by Science Citation Index. Scientometrics, 84(3), 575-603.


Figure 1. New academic publications per year for all research indexed by Web of Science (upper line) and Psychological research (lower line).