How success breeds success in the sciences

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Berkeley Haas Assistant Professor Mathijs De Vaan. Credit: UC Berkeley Haas

A small number of scientists stand at the top of their fields, commanding the lion's share of research funding, awards, citations, and prestigious

academic appointments. But are they better and smarter than their peers? Or is this a classic example of success breeding success—a phenomenon known as the "Matthew effect"?

Mathijs De Vaan, an assistant professor in the Haas Management of Organizations Group, believes it's clearly the latter. In a paper published this week in *Proceedings of the National Academy of Sciences*, "The Matthew Effect in Science Funding," De Vaan presents the results of a study of Dutch research grants that shows precisely how much of an advantage early achievement confers, and identifies the reasons behind the boost. De Vaan, who came to Haas in 2015 after earning a PhD in sociology from Columbia University, co-authored the paper with Thijs Bol of the University of Amsterdam and Arnout van de Rijt of Utrecht University.

"To those who have, more will be given"

The term "Matthew effect" was coined by sociologist Robert Merton in the 1960s to describe how eminent scientists get more recognition for their work than less-well-known researchers—the reference is to the New Testament parable that, to those who have, more will be given. Previous attempts to study this phenomenon have yielded inconclusive results, in part because it is hard to prove that differences in achievement don't reflect differences in work quality.

To get around the quality question, De Vaan and his co-authors took advantage of special features of the main science funding organization in the Netherlands, IRIS, which awards grants based on a point system. Everyone whose application scores above the point threshold gets money, while everyone below is left out. The authors zeroed in on researchers who came in just above and just below the funding threshold, assuming that, for practical purposes, their applications were equal in quality.

First off, they found the benefits of winning an early-career grant were enormous. Recent PhDs who scored just above the funding threshold later received more than twice as much research money as their counterparts who scored immediately below the threshold. The winners also had a 47 percent greater chance of eventually landing a full professorship. "Even though the differences between individuals were virtually zero, over time a giant gap in success became evident," De Vaan notes.

Status and participation

De Vaan says that two main mechanisms may explain the Matthew effect in science funding. First, winners achieve status that can tilt the playing field in their direction when it comes to funding, awards, and job opportunities. The second is participation, meaning that successful applicants continue seeking grant money, while unsuccessful applicants often give up, withdrawing from future competition.

De Vaan and his coauthors argue that the Matthew effect erodes the quality of scientific research because projects tend to get funded based on an applicant's status, not merit. Groundbreaking work may not get done because the researchers are unknown or too discouraged to compete for funds. They recommend several reforms to the funding process, including limiting information grant application reviewers have about previous awards. They also suggest that rejected applicants learn their scores, which might encourage those just below the threshold to try again.

These findings may apply in many areas beyond science. For example, the Matthew effect may also widen a gulf between winning and losing entrepreneurs in the race for venture capital. Even the Academy Awards may favor big movie industry names over lesser-known talent. "There are a lot of social settings with large amounts of inequality, which could

be ripe for the study of the Matthew effect," De Vaan stresses.

More information: Thijs Bol et al, The Matthew effect in science funding, *Proceedings of the National Academy of Sciences* (2018). DOI: 10.1073/pnas.1719557115

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