When 'superstar' scientists die

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(PhysOrg.com) -- When "superstar" academic scientists die, their collaborators experience a significant and permanent decline in productivity, according to a recent paper coauthored by MIT Sloan School of Management Professor Pierre Azoulay. Studying the role of collaboration in spurring the creation of new scientific knowledge, he found that the more the collaborators' areas of study overlapped with the superstar, the sharper the decline in output.

The study was conducted with a panel of 8,220 scientists who had coauthored papers with a superstar scientist who subsequently died prematurely. The authors measured how collaborators' scientific output -- determined by publications, citations, and National Institutes of Health (NIH) grants -- changed after the "extinction" of the star. Superstardom was assessed on the basis of several criteria, including funding, citations, and membership in the National Academy of Science.

"Our results reveal a 5 to 10 percent decrease in the quality-adjusted publication output of coauthors in response to the sudden and unexpected loss of a superstar," wrote the authors in a working paper titled, "Superstar Extinction," published by the National Bureau of Economic Research.

This finding supports the concept of the "invisible college," said Azoulay. "Our interpretation is that superstars infuse their scientific field with fresh ideas. They replenish it periodically and when they die, the entire field contracts so it's really about their ideas and the effects of losing them are fairly broad and diffused."

The closer a collaborator is with the superstar in terms of "intellectual space" -- topics and ideas studied -- the greater the productivity loss. For example, a former trainee or graduate student supervised by the superstar might see twice as much of a decline in output as a collaborator who is not as involved in the area of the superstar's expertise.

"[T]hese results paint a picture of an invisible college of coauthors bound together by interests in a fairly specific scientific area, which suffers a permanent and reverberating intellectual loss when it loses its star," wrote the authors.

Azoulay noted, "The big surprise is that geographic proximity to the superstar wasn't a factor. Local coauthors were just as affected by the death as distant ones."

The study also ruled out several other factors such as the stars' connections to NIH peer-review panels. The authors found no evidence that such connections made any difference. "There are an infinite number of ways you can think of superstars as gatekeepers to resources, but we found no support to connect their role as gatekeepers to the decline in their collaborators' productivity in our data," said Azoulay.

The study also eliminated as a factor the inevitable disruption following the death of a superstar team member as the group searches for a substitute coauthor. The authors found that current collaborations were not actually affected by such a loss. Moreover, the effects were permanent rather than temporary, and delayed until several years after the death.

On a cheerier note, they concluded "for every invisible college that contracts following superstar extinction, another might expand to slowly take its place. Viewed in this light, our work … support[s] … Max Planck's famous quip: 'science advances one funeral at a time.'"

The paper was coauthored by Azoulay; Professor Joshua Graff Zivin of the University of California, San Diego and the National Bureau of Economic Research; and MIT Sloan PhD student Jialan Wang.

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