The Coming Hangover: Magnified Effects of Sequestration on Research Enterprises

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As of March 1, 2013 the US government is taking an $85 billion budget cut. Also referred as the “sequestration”, this automatic spending cut policy might continue for several upcoming years and potentially affect many industries, including the research enterprise.¹ ² The cut is expected to reflect in the budget of federal agencies that support research activities, such as the National Institutes of Health (NIH) and the National Science Foundation (NSF). For a wide range of reasons that are rooted in the structure and processes of research institutions, the impact of the budget cut will be magnified. Therefore, the time is ripe to consider new policy actions to help mitigate any anticipated side effects.

In response to a forced decline in total research budget, there are two major possible actions that federal agencies such as NIH and NSF can take: 1) to cut current commitments by underpaying the ongoing projects, and 2) to fulfill the existing commitments and shift most of the burden on the new competing awards. The first strategy works against long term planning desire in research enterprises. Many projects need several years of investment to give fruit. Cutting budgets also has other impacts, affecting the size and diversity of the research workforce pool as grants supporting currently enrolled graduate students and postdoctoral associates’ grants might be cut.³ ⁴ The alternative action – which is more common - is to fulfill the current commitment, and lower funding for new awards. Early reactions from NSF to the possible upcoming sequestration show that they will likely cut new awards, rather than current efforts.⁴

Larson, Ghaffarzadegan, and Gomez (2012) discuss how shifting the burden on the new competing awards in response to a change in total funding can have magnified effects on the research community, way beyond expectations.⁵ Consider a federal agency that awards competitive research grants, each grant flat-funded for four continuous years. Suppose in the past, the agency’s budget for funding research activities has been $10 billion. In the steady state condition, 75% of total funding goes to commitments coming from the past three years ($7.5 billion) and 25% remains for new competing grants ($2.5 billion). The new grants, then, add to the next three-year commitments. Let us suppose that in year 2013, government decides to sequester the total budget by only 10%, which would decrease total budget to $9 billion. In order to fulfill the past commitments, the new awards have to decline to $1.5 billion, which in comparison to the ongoing $2.5 billion dollar shows a 40% decline, four times magnified in comparison to the change in total funding.

This phenomenon is referred as the rule of τ, which states starting from steady state, an X percent change in this year’s funding results in a τ X% change in new funding for this year, if average
project duration is $\tau$ years. Larson et al (2012) analyze the effects of the described phenomenon for a longer time horizon and demonstrate that a sudden change remains in the memory of the system and can introduce periodic shocks in new competing awards, with a time period around $\tau$ years, before it eventually dampens. Controlling the shocks, they demonstrate, requires careful management, and a combination of change in several variables, including grant duration and incremental changes in budgets.\textsuperscript{vi}

The effect of change in total funding on the research enterprises gets even more magnified when we reflect on grant application success rate. Grant application success rate is the ratio of number of the competing grants to the number of grant applications, representing the likelihood of winning an award. For an agency that awards grants for an average of four years, given that grant size is kept constant, an $X$ percent decrease in total budget results in $4X$ percent decrease in competing awards, and for a constant level of grant applications, a $4X$ percent decline in grant success rate. This can be a considerable decline in the likelihood of getting a proposal funded. Grant applicants who work based on soft money or are under pressures by their institutions to bring funding, many times, as a requirement for promotion, are likely to try to increase their chance by submitting more grants to more agencies. As a result, the number of grant applications also increases, resulting in even more decline in grant application success rate, a reinforcing feedback loop.\textsuperscript{vii} The total effect thus can be more frustrating for the research community than anticipated.

All efforts to submit more and higher quality grant applications result in less time available for the ‘actual’ research, and less research published or disseminated. This phenomenon is already perceived by many researchers as a form of a shift in the processes of research enterprises from doing research to writing grant proposals, and sequestration is likely to exacerbate it.\textsuperscript{vii} Furthermore, higher competition increases the standards of getting funding which might disproportionately favor more established and experienced researchers and negatively affect workforce development for young scholars. In many fields the trend of average age of first time R01 award winners has been increasing in the past years\textsuperscript{ix}, and more competition will accelerate the growing trend.

Changes in grant sizes in order to soften the decline in number of grants might help mitigate the decline in success rate and decrease the risks of not getting any funding. In such circumstances more grant applicants receive grants but at lower funding levels. And with more grants, albeit at lower levels, the risks of being shut out for young and under-represented groups of scholars would decrease.

It is important to mention that budget control by itself is not necessarily an improper policy if careful considerations can be made at the implementation phase. For example, budget cuts can decrease the number of newly admitted PhD students and help control the growing number of postdocs, and grant applicants in the long run. It can also help in mitigating academic job market hassles by letting the market make more efficient decisions regarding graduate school admissions.

Unintended effects of the growth in NIH funding during 1998-2003 are well documented in the literature.\textsuperscript{x} However, the main lesson is that change in research funding should be smooth rather than abrupt, predictable for the research community, and well controlled. Managing economic effects of transitions needs a careful examination of how the research enterprise is surrounded by
complex systems and structures. Mitigation of the side effects of sudden changes in total funding is complex and needs strategies that include combinations of careful changes in different variables including change increments in total budget, average grant duration, grant size, and the percentage of sequestration shifted toward new competing awards vs. past commitments.

References and Notes:


vi The study shows that the year immediately after a magnified change in competing awards, commitments decline and therefore competing awards approach its previous steady state level, but after a few years – dependent on average grant duration- competing award again experiences magnified changes.


