R&D Spending: Steady Wins the Race

By Jurgen Mihm , INSEAD Professor of Technology and Operations Management

To maximise R&D output, firms should evenly spread their R&D spending over time.

In business, both persistence and dynamism have a certain ring to it. Persistence suggests steadiness and a concern with achieving long-term goals. Take HP's decision to go into the computer market. When its late CEO David Packard committed to the idea, he said: "We need to be the number one computer vendor. It will take us **25 years**. We'd better get started." The year was 1980. Packard's goal became reality 22 years later. On the other hand, what's not to love about dynamism? It evokes a nimble attitude suited to fast-changing business landscapes. It can allow a firm to swiftly grab opportunities as new fields open. Famous examples include YouTube, which started out as a **dating website**, and Twitter, the pivot of a **podcast platform** company. Even Instagram was a multipurpose app including check-in and gaming functions before it got rid of everything but the **photos** .

Innovation is the holy grail of many companies. However, when it comes to how firms spend their R&D dollars, which – between persistence and

dynamism – is the spending style more likely to yield productive results? In our research paper, **“R&D Spending: Dynamic or Persistent?”**, Christophe Pennetier (INSEAD PhD candidate), Karan Girotra (Cornell) and I showed that, on average, stable spending patterns are preferable to more flexible ones when it comes to improving both R&D output quantity and quality.

One strength of our study is its very broad dataset. We looked at thousands of publicly listed U.S. companies with sizeable R&D budgets that produced millions of patents between 1982 and 2003. We examined both the number of patents issued on behalf of these companies, as well as the quality of their patents, defined as the number of citations generated by these patents.

Gestation period

How do we explain our findings? In a nutshell, frequently starting and stopping R&D efforts is inefficient. A firm that continuously alternates between “up” and “down” spending will always be needing to bridge an unproductive phase. Personnel is typically the biggest expenditure in R&D. When a firm brings new staff on board, they will need to learn the ropes before they can be fully productive. Even if new funds are spent on equipment rather than personnel, firms can expect a lag in productivity. Knowledge creation takes time to reach an optimal steady-state level. In contrast, any reduction in R&D spending interrupts the flow of new knowledge immediately as researchers are laid off and as machines are sold or repurposed.

We estimated that in realistic scenarios, persistent R&D spending can improve the quantity of R&D output by 5 to 10 percent and the quality of such output by up to 30 percent, compared to dynamic R&D spending. R&D output quality is the biggest victim of erratic spending.

Not a condemnation of dynamism per se

However, further analysis revealed one important exception to the negative relationship between dynamic spending and R&D productivity. In the tech industry, spending flexibility seems to be as critical as steadiness, and no pattern wins out. Our study results apply more particularly to low-clockspeed industries, such as manufacturing.

But even in industries that would gain by adopting stable spending patterns, the good news is that it is possible to mitigate the negative impacts of shifts in R&D spending. The unpredictable part of any dynamic spending pattern is what hurts R&D performance the most. If upper management can provide advance guidance regarding budget fluctuations, R&D managers can strategically manage their resources (personnel and otherwise) and avoid knee-jerk shifts.

Many factors have been shown to stretch R&D budgets. Centralised R&D, long-term incentives and even conference attendance have all been linked to higher R&D productivity. Our study adds one more: R&D spending patterns should be kept as constant as possible.

Companies may want – or be compelled – to adapt their level of R&D spending for reasons unrelated to innovation productivity. Strategic reasons may very well require shifts in R&D spending and we are not condemning dynamism per se. However, in most industries, managers should know that seesaw spending is likely to do considerable harm to R&D performance and output. Increasing R&D spending the next quarter won't undo the harm done by cuts in the recent past.

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