

# Country comparisons cast doubt on science policy orthodoxy

Policymakers and researchers have long sought measures to compare countries' scientific performance. The most widely used has been to divide levels of public R&D spending by numbers of publications or citations.

Simply dividing funding by outputs, however, is not likely to give an accurate portrait of a research system's efficiency. Countries differ greatly in how their research budgets are organised and administered, in how PhD studentships are financed, for example. And while in theory the data for OECD statistics are collected in the same way everywhere, in practice this is not the case. These factors and others make it unwise to use R&D spending levels when comparing the performance of national research systems.

In a recent paper, we propose a new way of making international comparisons between research systems. Instead of looking at spending in isolation, we focus on the relationship between changes in input and changes in high-quality outputs, in the shape of top 10 per cent of most cited papers. In other words, we compare how much countries get out of each additional unit of spending on R&D. This method has the advantage of sidestepping the structural differences between countries.

We looked at 18 countries and found that differences in inputs accounted for nearly 70 per cent of the variation in scientific output. In other words, more spending produces more high-quality science.

This, however, still leaves 30 per cent of the variation in scientific performance to be explained by factors other than funding. The obvious candidates are those decisions that dominate research policy discussions: the share of competitive funding relative to core funding, whether the allocation of core funding is performance-based, the degree of university autonomy and academic freedom.

The data on these are far from perfect, making a definitive answer impossible at this stage. But we can still use them to raise questions, challenge assumptions and compare alternatives—the more so, as other studies based on the same data feed into policy decisions.

In the past few decades, most countries' research policies have been shaped by ideas about competitiveness and autonomy. The share of competitive project funding is increasing, as is higher education institutions' freedom to control their strategies and budgets.

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Both are claimed to make science systems more efficient.

We found, however, that increasing competition for resources does not improve efficiency and quality. In fact, competitiveness and quality are negatively correlated. Countries with a high proportion of project funding, such as the UK and Finland, show smaller gains in output as spending increases than countries with a high level of direct funding, such as the Netherlands and Spain.

We also found that countries with retrospective research evaluation systems are considerably more efficient, although the evidence is weaker for those with 'strong' evaluation systems that have direct funding effects, such as the UK's Research Excellence Framework.

Also contrary to expectations, there was no relationship between the financial autonomy of universities—measured as their degree of control over their long-term budgets—and a nation's research performance. Other dimensions of university autonomy, such as control over staffing, teaching, governance and work environment, correlate negatively with efficiency. That is, the more freedom institutions have to make decisions in these areas without interference from government, the smaller the marginal gains from research spending.

The cause of this relationship might lie in the relationship between institutional autonomy and academic freedom. More autonomy for universities typically goes hand in hand with more power for managers at the expense of faculty. Data on academic freedom are sparse, but those available show a negative correlation between academic freedom and managerial autonomy at university level.

Productive and efficient science systems, then, seem characterised by a well-developed ex-post evaluation system combined with high institutional funding, and relatively limited university autonomy in the form of managerial power. Less efficient systems seem to have strong upstream control of research, through some combination of a high level of competitive project funding and powerful university management.

It is worth reiterating that the paucity and quality of the data make these conclusions provisional. Better data are needed from more countries. It is also important to include other types of output beyond highly cited papers, to see how returns to society depend on institutional and structural characteristics. Even so, what data there are fail to support many of the received wisdoms of research policy. *Something to add? Email comment@ResearchResearch.com*

'Increasing competition for resources does not improve quality.'