Book review: The economic laws of scientific research, by Kealey, T., Houndmills, Hampshire: Macmillan Press and...

William F Shughart

Managerial and Decision Economics

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competitive contracting for controlling transit costs in the United States and abroad. Chapter 16 sketches the competitive contracting experience of a single transit system, that of San Diego, describing cost savings and its experience in managing contracts. The system’s effective monitoring program is attributed to: (1) performance incentives and penalties and (2) a regular staff that is given the task of monitoring contracted service. Chapter 17 poses the question why the New York City subway should be privatized. The city will retain a share in any profits and funds currently used to subsidize the subway can be released from the city and state budget to fund alternative desirable projects such as repairs and rebuilding of the city’s roads, bridges and sewers. Chapter 18 chronicles the US government’s creation of the freight railroad, Conrail, and its subsequent sale to the private sector (that is, its privatization), showing that effective reform of economic institutions is a slow and difficult process. Time is required to complete and review all analyses and for affected parties to adjust.

In summary, this book makes a significant contribution to the transportation privatization literature by bringing together in one volume privatization experiences across several modes. However, the book tends to be repetitious, especially in its coverage of private toll roads. Further, this reviewer was disappointed with its coverage of port privatization. Although port privatization has spread throughout the world in recent years, no case studies were provided to chronicle the process and its impact. Another shortcoming of the book is its coverage of railroad privatization. One railroad chapter is included, the Conrail chapter, but placed with the mass transit chapters, clearly misplaced. Just as for ports, railroad privatization is also spreading throughout the world; chapters dealing, for example, with the experiences in the United Kingdom and New Zealand would have been informative. Also, this reviewer was disappointed that the book did not end with a where-to-go-from-here (the future of privatization) chapter.

WAYNE K. TALLEY
Department of Economics,
Public Administration and Urban Studies
Old Dominion University
Norfolk, Virginia 23529 USA

THE ECONOMIC LAWS OF SCIENTIFIC RESEARCH,

One of the meager benefits of being a book review editor is having first pick of the titles crossing one’s desk. To my own great profit, I exercised this privilege with Terence Kealey’s The Economic Laws of Scientific Research, a forceful, wide-ranging, and erudite critique of public policy toward science. Anyone who reads the book’s ‘Preface and Acknowledgments’ will at once be engaged and kept absorbed until the last page by the author’s fluid exposition, his incisive observations on the folly of government funding of scientific research, and, not least, his wry humor—Kealey gets off some of the best one-liners in the contemporary scholarly literature.

Economists such as Nobel laureate Robert Solow and, more recently, Paul Romer, who have studied the contributions of technological change to economic growth should be positively embarrassed that it has taken a clinical biochemist to demonstrate that the emperor-sponsor of R&D has no clothes. (Romer in particular ought to be nearly suicidal to see long passages of his turgid prose cheek to jowl with Kealey’s faultless phraseology.) And supporters of government funding for the arts and humanities should be terrified at the prospect that a critic as eloquent as Professor Kealey might be waiting in the wings to examine their case.

The Economic Laws of Scientific Research manoeuvres the reader through the set-piece battle waged between two very different world-views of the determinants of economic progress and of the sources of the new products and new technologies that underpin it. Commanding one side is Francis Bacon, who fathered the idea that pure science comes before applied science. In other words, the new technologies and new products that are the engines of enhanced productivity and economic growth depend crucially on advances in basic scientific knowledge that are by their very nature unmarketable and, hence, will not be supported at socially optimal levels by commercially minded enterprises. Government subsidy of pure science is consequently essential to prime the pump of economic progress.

Commanding the other side is Adam Smith, who concluded from empirical observation that applied science begets applied science. In the main, technological progress springs not from the efforts of the selfless scientific truth-seekers of academe but rather from the discoveries of engineers, operatives, and others employees of commercial enterprises who encounter practical production problems and who, being close to the market, have access to the information and face the incentives necessary to solve them. Pure science is valuable only to the extent to which it contributes to the solving of these practical problems, but (and this is a key point) to the extent to which it does, commercial enterprises will fund it. Science, both pure and applied, will flourish under a policy of laissez-faire if Smith is correct and, moreover, such a policy will avert the heavy tax and bureaucratic tolls government exacts in return for its largesse.

With these two world-views in mind, The Economic Laws of Scientific Research proceeds systematically to demolish the Baconian model. It does so by marshaling a mass of historical evidence demonstrating that mankind’s great inventors have often been uneducated, sometimes illiterate, and almost always ignorant of the basic science underlying their discoveries. Indeed, the historical record shows that advances in pure science have not uncommonly followed the trials blazed by applied science. Technology not only breeds technology in a learning-by-doing fashion, it also breeds science. Moreover, rather than emerging from the
ivory tower as Bacon would have predicted, innovation generally occurs in the R&D departments of industry: according to one study, ‘ninety per cent of new technology arises from the industrial development of existing technology, not from academic science’ (p.216).

Kealey builds his case for the model of Smith in a series of chapters that concisely trace the history of science and technology during antiquity, the Dark Ages, and on through the commercial, agricultural, and industrial revolutions. The main lesson here is that ‘science is not a delicate little flower, whose fragility demands the protection of the state’ (p. 306). Under the laissez-faire regime that made Birmingham the workshop of the world, British science attracted funding from a variety of private sources, including the ‘hobby scientists’ (wealthy men such as Henry Cavendish, Charles Darwin, and William Parsons who, freed from the burden of heavy taxes and death duties, devoted their lives to science), industrialists who promoted science for commercial advantage by conducting R&D in-house and by establishing universities and research institutes, philanthropists who endowed university professorships, and the universities themselves which, responding to industry’s need for trained scientists, were fully funded by students’ fees, private commissions, and gifts. While the strictures of the market dictated that priority was given initially to applied science, as the Industrial Revolution played out industrialists perceived that they were exhausting technological development and they began to explore basic science more profoundly. In sum, ‘the Industrial Revolution was born in Britain because Britain was laissez-faire. In the early years, the free market correctly directed investment into technology, but as the revolution accelerated, it correctly directed more and more investment into pure science. Britain’s industrial and scientific success, therefore, evolved out of its commercial success...’ (p. 81).

Kealey next brings statistical evidence to bear in chapters that trace economic history since 1870 and describe the science policies of the twentieth century. Comparative data from the OECD and other sources establish that productivity is the engine of economic growth and that richer countries (as measured by GDP per capita) both do more science (as measured by scientific papers published and patents filed) and better science (as measured by the citation rates of scientific papers). In the process of interpreting these empirical regularities, Kealey elaborates what is essentially the ‘convergence hypothesis’ of economic growth: provided they embrace market institutions, poor countries grow faster than rich ones. They are able to do so in part because copying (and frequently improving) the technology invented by their richer neighbors is cheaper than developing their own.

The predictable slow-down in growth experienced by the richer industrialized countries has, also predictably, triggered demands for more taxpayer funding of science. Wars as well as peacetime anxieties over the prospect that, pick one, France, Germany, the former Soviet Union, or Japan are catching up have also played important roles historically in generating calls for massive government support of military and civil R&D. As told by Professor Kealey, the evolution of science policies in the UK and the USA is largely a story of fear-mongering and bald rent-seeking by coalitions of prominent scientists and empire-building bureaucrats. As a result of the efforts of these groups, which pushed their agendas by (false]ly on Kealey’s evidence) raising the specter of the decline of British and American science, the institutions of scientific research were nationalized and politicized (more so in the former nation), displacing laissez-faire with central planning and reliance on the state.

What has government subvention of science wrought? In reviewing the sorry record, Kealey adduces evidence showing that central planning works no better in the lab than it does in other realms of economic life. Government funding has produced neither more science nor better science because governments institutionally cannot pick ‘winners’: ‘Governments are dreadful judges of commercial opportunities’ (p. 204). They are too distant from the market, too short-sighted, and too vulnerable to pressure-group demands to allocate research funds to their highest valued uses and, because government perforce must tax industry in order to subsidize it, public funding for civil R&D displaces private funding. Even worse, this displacement is more than proportionate: less is invested overall in civil R&D in those countries whose governments spend the most on it.

The skewed research priorities, the lost academic freedom, and the culture of mediocre grantsmanship that government funding of science has spawned are masterfully detailed in the book’s concluding chapter. But what of the theory of ‘market failure’ that proponents advance to justify taxpayer subsidy of science? Isn’t science, especially pure science, a ‘public good’ that will be undersupplied if support for it is left to commercially minded enterprises? Kealey cites two studies showing that private firms which invest in basic research tend to grow faster and to outperform these which do not. R&D pursuits are commercially profitable not because firms expect to capture all of the returns to their effort, but rather because they can appropriate enough of them to make their investments worth-while. First-mover advantages (lead time over imitators) apparently provide powerful incentives for commercially minded firms to fund scientific research.1 Kealey also suggests that private firms invest in basic science partly as a way of compensating industrial scientists who, though they derive the most personal satisfaction from doing their own original work, must, because many technological advances are in fact produced by more mundane activities, spend much of their time reading and assimilating research results published by others. (Firms will of course not pass up the opportunity to exploit the rare breakthroughs achieved in their own R&D departments.)

I only have two quibbles with The Economic Laws of Scientific Research: Gordon Tullock’s last name is misspelled consistently and, like some impotent member of the Club of Rome, Kealey misapplies the law of diminishing returns to forecast an upper limit to economic growth. Fortunately for his readers, the predicted limit will not be reached until the end of the twenty-first century, and fortunately for his readers’ progeny, at the limit living standards will be at levels 20 to 100 times higher than today.

While a great deal of what Professor Kealey has to say

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will not come as too much of a surprise to economists trained in Chicago, Los Angeles, or College Station, *The Economic Laws of Scientific Research* throws cold water in the faces of the arrogant dons of Cambridge (both of them), Palo Alto, and Berkeley, who think they know better than mere businessmen how to optimize investments in research and development. As Kealey so well puts it, ‘capitalism should be left to the experts—capitalists’ (p. 206).

The same dead hand of bureaucracy that has systematically destroyed the publicly funded schools and universities of the USA and the UK rests heavily on the scientific establishments of both countries—and the demands for more of the same are loud. Perhaps Professor Kealey is right in predicting that, because the limits to which democracies will allow government to absorb private wealth have been reached, civil R&D is on a path to eventual privatization. As *The Economic Laws of Scientific Research* also informs us, however, taxpayers have long been swindled by appeals for more spending on education and technology. But if they begin turning a deaf ear to this special pleading, we will have Terence Kealey to thank.

NOTE

1. Indeed, in only one of the industries surveyed by Levin, Klevorick, Nelson, and Winter (1987)—pharmaceuticals—did the respondents consider patents to be strictly more effective than other means (getting a head start, protecting their trade secrets, and so on) of appropriating the returns to R&D.

REFERENCE


WILLIAM F. SHUGHART II

*Department of Economics and Finance, University of Mississippi, University, MS 38677, USA*
Because many individuals would take the decisions to fund science if it were left to the private and charitable sectors, this would lead to a more rational outcome than the state would produce. The problem with this ideology is that the experiment has already been tried. Until the first world war, successive British governments took little interest in science other...