science progress

British Innovation Policy

Lessons for the United States

William Straw, January 2009

IN MARCH 2008, the British government published a report, *Innovation Nation*, which flagrantly ripped off the title of technology guru John Kao's critically acclaimed book about the demise of America's innovation edge. Yet there is some truth to the Labour government's bold claim. Having been the nation of economic decline, lagging behind its major competitors in the Group of 7 industrialized democracies and only able to reminisce about its 18th- and 19th-century role as the workshop of the world, Britain now has an economy that (until the global credit crunch) had been growing for the longest continuous period in two centuries.

One reason is that since coming to power in 1997, the Labour government systematically focused on Britain's innovation policy. Through increases in public expenditure to fund science and knowledge transfer and to bridge the so-called "valley of death" between innovation and commercialization, the government has helped enable an environment where innovation is thriving. Most noticeably the quantity and size of regional innovation clusters and the value of companies within them have both increased.

The design of much of this policy was directly borrowed from what was already happening in universities up and down the United States following the ground-breaking work of Michael E. Porter. But after a decade of overtly focusing on innovation economics, Britain appears to be moving ahead of the United States with regard to the innovation of innovation policy.

A new focus on service-sector innovation and the hidden innovation not captured by the traditional measures of patent filings and research-and-development expenditures has put the United Kingdom ahead of the curve. There are also a couple of other, more common measures, such as science teaching and venturing efficiency—the number of venture capital investments that lead to successful commercialization—where Britain's performance is outstripping that of its transatlantic partner.

There are lessons here for the new administration and Congress taking office in January. Policymakers on both sides of the aisle are eager to implement ideas—some of them in this collection of essays—to boost U.S. competitiveness in science, technology, and innovation. But before outlining these lessons for U.S. policymakers, it is important to sketch the development of Britain's innovation policy. Indeed, understanding how British policy developed to where it is today is perhaps the first lesson U.S. policymakers should consider.

THE BEGINNINGS OF AN INNOVATION POLICY

Once in power after 1997, the Labour government set out a specific economic-policy goal of closing the productivity gap with France, Germany, and the United States. In November 2000, the government published *Productivity in the UK: the evidence and the Government's approach*. It concluded that "the UK's productivity gap can be accounted for by its deficit in physical and human capital and its lower rate of innovation compared to other major economies."[1] For example, it outlined that R&D as a share of GDP had fallen to 1.9 percent in 1999 from 2.2 percent in 1990.

In order to address this decline, the Labour government in July 2004 published its ten-year science and innovation investment plan. This set out the aim "to increase the level of knowledge intensity in the UK (as measured by the ratio of R&D across the economy to national gross domestic product), from its current level of around 1.9 per cent to 2.5 per cent by around 2014."[2] From total science expenditure of £4.2 billion (about $6.7 billion at the time) in 2004–05, the science base will rise to £6.3 billion (about $10.7 billion at today's exchange rate) in 2010–11. In addition, over £1 billion will be available in public support for business innovation

HISTORY OF BRITISH INNOVATION POLICY

As in the United States, innovation policy in the early 20th century was aimed squarely at discoveries to improve the efficiency of warfare. This model proved itself in World War II with innovation around radar, jet aircraft, the atomic program, and code breakers. Following World War II, the British government adopted a consensual approach where, according to Robert Jackson, science minister on two occasions in the 1980s and 1990s, "the basic assumption was that the State should improve the supply of science, it was simply assumed that the demand side existed." There was a huge expansion of university education and more focus on applied science research with the creation of five sectoral Research Councils. But Britain continued to be, says Jackson, "rather bad at transferring a bright idea in a university to business to marketization."

This approach was stopped short when the teachings of Milton Friedman and the Chicago School became popular in Britain. Upon becoming prime minister in 1979, Margaret Thatcher set about reducing the level of public spending. This included slashing the budget for universities and sectoral R&D. Her view was that while the state should support basic or pure research, the market should pay for its own applied research.

Following John Major's emergence as prime minister, the pendulum swung back as a new consensus emerged for an overt science policy. President of the Board of Trade Michael Heseltine pushed for a dirigiste, French-style industrial policy, but this view was rejected in favor of a more centrist package. The resulting 1993 white paper revamped the Research Council system and introduced a "Foresight Program" that put together researchers and business end-users in a forum to pursue the links between basic research and its application.

To some extent, this renewed statist role has persisted ever since. As Baron Waldegrave of North Hill, the cabinet minister in charge of the white paper, reflects, "I hope I shaped the institutions but [feel I] could have done more with more money." It took a progressive Labour government to prioritize both the resources and the policy beginning in the mid- to late-1990s (see main essay).

through Research Councils and Regional Development Agencies, among others. The government also introduced a new R&D tax credit targeted at small and medium companies to stimulate innovation in the private sector. This will increase the 100 percent relief for current spending on R&D to 150 percent.

But a shortfall in R&D expenditure was only half the picture. Great Britain was a historic laggard in its ability to commercialize basic research. Richard Lambert, a former editor of the *Financial Times* and now director-general of the Confederation of British Industry, was commissioned to review the links between universities and businesses. He published his final report in December 2003 and concluded, "Universities will have to get better at identifying their areas of competitive strength in research. Government will have to do more to support business-university collaboration. Business will have to learn how to exploit the innovative ideas that are being developed in the university sector."[3]

Lambert set out that the best form of knowledge transfer involves human interaction and prescribed a number of recommendations to improve the distribution of intellectual property rights between universities and businesses. He outlined the need to improve the quality of technology transfer offices in universities and recommended the creation of a Higher Education Innovation Fund to facilitate this. (The fourth round of HEIF funding was announced recently, and £150 million will be available by 2010–11, with 36 of the 130 eligible institutions of higher education to receive a full grant of £1.9 million. This represents a 30 percent increase in funding from 2007–08.)

Since the first round of HEIF funding was allocated, the size of offices at the leading research institutions has mushroomed. Case in point: Cambridge Enterprise Ltd., the university's commercialization office, now boasts 37 staff, up from five people in 1999. And there has been a similar story at Imperial College London, University College London, and the Universities of Oxford, Edinburgh, Glasgow, and Manchester. These departments generally have a broader remit than U.S. technology-license offices. In addition to the intellectual-property functions, they provide seed funding and expertise on access to capital for new ventures, mentor the entrepreneurs behind new business ventures, and offer consultancy services to link top academics with public- and private-sector organizations worldwide. In 2006–07, Cambridge University expanded its equity portfolio to 72 companies and invested an additional £750,000 in startups.

Alongside the *Lambert Review*, the government published a document on access to finance. It identified a phenomenon similar to the well-documented "valley of death" in the United States: "an equity gap for investments that are beyond the financial means of most informal investors, but too small to attract venture capital funding."[4] In response, Enterprise Capital Funds, based on the U.S. Small Business Investment Company, was established to target investments of up to £2 million.

Some are skeptical about whether this investment has been well spent, questioning whether the increases in the scale and activity of knowledge transfer offices or equity finance have tangibly changed local business performance. Lord Sainsbury of

Turville, Britain's science minister from 1997 to 2007, however, says that "in the past four to five years, 31 spin off companies have floated at a value of £1.5 billion and ten spin offs have been sold for £2 billion."

The final piece of the jigsaw was recognition of the interlinking contribution of infrastructure and human capital to innovation. In order to tackle these long-term policy areas, Gordon Brown as chancellor of the Exchequer developed a model of policy development centered on an independent review. These assessments involved detailed research and public consultation summarized in a lengthy report containing a series of recommendations.

The aim of these reviews was to provide the political space for the government to make difficult long-term decisions that required significant investment or reform. By inviting respected industry or academic figures to undertake the research away from the glare of Westminster politics, consensus was created for resulting legislation. The policy outcomes were aimed at equipping the United Kingdom for what Brown termed "the challenges and opportunities of globalization." This was often explicitly linked to the innovation agenda. By making cities attractive places to live, so the logic went, graduates would be more likely to stay after graduation. Alongside the added investment in science and technology transfer, this focus on infrastructure and human capital would increase the chances of a regional cluster emerging, with resulting benefits for the whole community.

In line with this approach, Sir Rod Eddington, former chief executive of British Airways, led a review of transport policy and recommended that addressing local "pinch points" was more effective than large-scale projects. Kate Barker, a member of the Bank of England's monetary policy committee, led a review of land-use planning which recommended greater speed, efficiency, and responsiveness in the planning system, including a new centralized Planning Commission to make decisions on major infrastructure projects.

Lord Sandy Leitch, a leading financial businessman, undertook a review of British skills' policy, setting out how to increase skills attainment at all levels by 2020. His assessment: "the UK's skills base has suffered from historic deficits built up over a long period of time, despite pockets of excellence 7 million adults lack functional numeracy and 5 million lack functional literacy [out of a population of 60 million]."[5] His review also highlighted the complexity of the 22,000 qualifications in the British system: "too many of these, particularly at lower levels, are little valued by individuals or employers."[6]

But not everyone is enthusiastic; Lord Sainsbury says he is "not certain that Leitch says anything that hasn't been said ten times already. [I am] not sure it will make any difference." Nonetheless, the government is engaged in a program to improve skills in Britain.

THE LESSONS LEARNED

In the past two years, Britain has begun to look toward a broader innovation policy. In October 2006, the National Endowment for Science, Technology and the Arts outlined the need for "a broad-based innovation policy that reaches beyond science and technology to embrace the 'hidden innovation' that occurs in all sectors of our economy."[7] This included a focus on sectors such as financial services, retail, consultancy, and the public sector where innovation does not show up in measures of R&D expenditure or patent filings.

This study was followed by a second NESTA report in June 2007 that looked at where this hidden innovation occurred, outlined where there were knowledge gaps, and recommended that the government "develop an annual sector-relevant Innovation Index to better guide policy development."[8] Then, in the government's recent *Innovation Nation* report, NESTA was given the green light to develop this index.

The Labour government hopes that this will enable NESTA to "identify gaps in current measures; embed existing innovation measures in a broader portfolio of other indicators that better reflect innovation outcomes and activities across the economy; improve our understanding of service sector, user-led and public sector innovation; and build on measures that innovative firms and their investors find useful."[9] This index is likely to include factors such as organizational change, investment in management and skills training, and competitive performance over time.

So what impact have these policies had on Britain's ability to innovate? "It's early days," says Professor David Secher of Sheffield University, "but although it's hard to know the results at this stage, the investment is likely to have an effect." He suggests that the increased funding for science and separate earmarked funding for technology transfer offices is likely to have a comparable effect in the United Kingdom as the Bayh-Dole Act had in the United States—1970s-era legislation that allowed the fruits of federally funded scientific research to be commercialized for profit by universities, inventors, and venture capitalists.

James Simmie, professor of innovation and urban competitiveness at Oxford Brookes University, supports this view. He says that "the investment is laying the foundation for later." Charlie Leadbeater, a leading authority on innovation and creativity in Britain and author of *We Think*, is more upbeat. He points to a considerable uptick in entrepreneurial activity in universities compared to ten years ago. He also states that both the quality of academic papers and the number of citations have increased.

There has also been a considerable rise in the number of spin-out companies compared to the 1990s. A recent report by Library House on university spin-out companies in the United Kingdom says, "There are now over 590 university spin-out companies in the UK which attract approximately 12 percent of all the UK's sub-

stantial venture capital finance."[10] In 2001, over 100 new spin-outs were incorporated. Although there is some debate about the quality of these companies, Library House compared how spinouts were viewed by investors in Britain and the United States. They concluded, "U.K. universities are exceptionally efficient at commercializing their research ... [and] more effective at converting their basic research into investible ventures."[11]

The success of the government's policy in creating regional clusters from scratch is less clear cut. Most analysis points to four primary clusters in Cambridge, Oxford, London, and Surrey. Library House stated, "R&D and venture-backed companies locate around high quality research to a far greater extent than around lower quality research universities." In 2004, the government and Regional Development Agencies designated the first of six "Science Cities" to lead the development of stronger and more widespread engagement between businesses and the science base.

These cities were Newcastle, Birmingham, Bristol, Manchester, Nottingham, and York. "The cities that didn't win went around rubbishing the others," says Professor Secher, "but they probably have not had a major impact on innovation especially when existing money was stripped out." There has also been little evidence that the increased expenditure has, as intended, trickled down into the poorer communities of targeted cities.

Professor Simmie suggests that government policy has been too focused on addressing market failures rather than creating market opportunities. He believes that innovation policy will only thrive if it is forward looking with a focus on health, defense, and research procurement. The United Kingdom has, however, structural difficulties that are restraining its ability to innovate. For instance, the monopsonist power of the National Health Service forces down the price of new medicines while the high regulatory bar set by the National Institute for Health and Clinical Excellence creates uncertainty for pharmaceutical companies because the National Institute makes the crucial decision about whether new drugs should be used by the NHS.

The Office of Fair Trading has said, "Replacing the current price and profit controls with a value-based approach to pricing will provide better incentives to invest for companies."[12] This points to the need for reform of the incentives within the health system before a significant increase in the level of R&D in the United Kingdom can be expected. Some recent progress has been made, however, with an agreement between the Department of Health and the pharmaceutical industry to meet the needs of patients, taxpayers, and industry.

The government's chief adviser on science over the past decade, Lord Sainsbury, has set out what he sees as the future of innovation policy. Last October, in a review of British science and innovation policy, he made a series of recommendations, including continued attention to supply-side factors such as funding support; improvements in the teaching of science, technology, engineering, and mathematics; and a focus on demand-side factors such as procurement and regulation.[13]

Chris Webber, an analyst at the Centre for Cities, a think tank devoted to urban policy, supports Sainsbury but thinks decision makers need to take a wider view on how they can support innovation. "There is a false dichotomy between innovation and economic development policy," he argues. "In an economy like ours, innovation is mostly about building and enabling human capital [and] that means delivering in areas like transport and planning, as well as science and technology."

Leadbeater goes further. "There's a lack of imagination," he says. "The linear, pipeline model encourages silo-based activity. We need a greater focus on the importance of demand and on non-science and technology players." Professor Secher agrees: "Universities and service companies don't talk to one another; there's a snobbishness from universities about dealing with service companies." But there does not appear to be a silver bullet to help promote service-sector innovation. Leadbeater concedes that it is hard to measure and also suggests that "the idea that government can do things is tricky."

Richard Halkett, executive director of policy and research at NESTA, also cautions against a pure "Sainsbury view." He argues that "it is not enough to focus on science production and high technology manufacturing to the exclusion of the services sector, public sector and creative industries. Government needs to look more closely at how to measure innovation and not to be the drunken man looking for his keys under the street lamp tracing innovation only to where it is most obvious."

Halkett notes that although measuring service-sector innovation is tricky, this is not a reason to avoid focusing on it. Sainsbury counters, "I don't see how you can create indices. If you can do it, great, but I'm skeptical that you can do it."

LESSONS FOR THE UNITED STATES

The British government's innovation policy has been fourfold: huge increases in expenditure on basic science research; incentives to encourage applied research in the private sector; enhanced institutions within universities to help address the United Kingdom's historic inability to commercialize advances in basic research; and finally, and most recently, policies to improve the ecosystem around a university and help establish or maintain a regional cluster. But since much of this looks like it is borrowed straight from Michael E. Porter's textbook on competitive advantage, what could the United States possibly learn from the British experience?

First, against some metrics, the United States is falling behind its industrialized democratic peers in the Organisation for Economic Cooperation and Development and even behind some

newly industrializing economies. The OECD's Programme for International Student Assessment ranks the United States below the OECD average in terms of student performance on science, with a score lower than Croatia and Latvia and significantly below China.[14] The United Kingdom, meanwhile, is near the middle of the top bracket. In relation to mathematics, the United States is even further behind, scoring lower than Azerbaijan, Russia, and the Slovak Republic.[15]

A second concern for the United States, points out Lord Sainsbury, is the inefficiency in creating regional clusters around second-tier universities. There is little doubt that the Massachusetts Institute of Technology and Stanford University stand out as the two most successful clusters in the world. But research by Library House suggests that Britain may be outperforming the United States in terms of the venturing efficiency (converting basic research into investable ventures). When the University of Wisconsin at Madison and the University of Washington, Seattle, were ranked against U.K. universities generally thought to have inferior research capability, the U.K. schools actually performed better against the Library House metric.

William B. Bonvillian, director of the MIT Washington Office, says that this could be due to a lack of focus on innovation organization in the United States—something that the United Kingdom's newly creative technology transfer offices have been keen to get right. Although MIT provides both technology licensing and a consultancy service for those looking to start a new business, Bonvillian says "there are not many other replicas of that elsewhere" in the United States.

The final area where Britain provides lessons for the United States is at the cutting edge of innovation policy. U.S. policymakers should watch closely as the policies outlined in *Innovation Nation* are rolled out, including the innovation index. With a tight fiscal situation in the United States, and arguably more pressing social concerns, scarce resources will need to be spent wisely. This therefore provokes the question of what provides the biggest bang for a government buck.

It can be argued that the United States already has incentives in place to encourage applied research and that commercializing basic research has not been the same problem that it has been in Britain. New information on the make up of innovation within society could therefore help a new administration decide whether to continue to focus its innovation policies on science and technology or whether there are opportunities and, indeed, a comparative advantage in the service businesses that make up 80 percent of the U.S. economy.

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ENDNOTES

1 HM Treasury, *Productivity in the UK: the evidence and the Government's approach* (2000), p. 17.

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3 Richard Lambert, *Lambert Review of Business-University Collaboration: Final Report* (2003), p. 2.

4 HM Treasury and Small Business Service, *Bridging the finance gap: next steps in improving access to growth capital for small businesses* (London: The Stationary Office, 2003).

5 Sandy Leitch, *Prosperity for all in the global economy: world class skills* (London: The Stationary Office, 2006), p. 10.

6 Ibid., p. 71.

7 National Endowment for Science, Technology and the Arts, "The Innovation Gap: Why policy needs to reflect the reality of innovation in the UK" (2006), p. 1, available at www.nesta.org.uk/assets/Uploads/pdf/Policy-Briefing/innovation_gap_policy_brief.pdf.

8 NESTA, "Hidden Innovation: How innovation happens in six 'low innovation' sectors" (2007), p. 25.

9 Department for Innovation, Universities and Skills, *Innovation Nation* (2008), p. 89.

10 Library House, "Spinning out quality: University spin-out companies in the UK" (2007), p. 2.

11 Library House, *An analysis of UK University Technology and Knowledge Transfer activities* (2007), p. 17.

12 Office of Fair Trading, "Statement regarding PPRS" (2007), available at www.oft.gov.uk/news/press/2007/115-07 (last accessed August 12, 2008).

13 Lord Sainsbury of Turville, *The Race to the Top: A Review of Government's Science and Innovation Policies* (London: The Stationary Office, 2007).

14 Organisation for Economic Cooperation and Development, *The Programme for International Student Assessment 2006: Science Competencies for Tomorrow's World* (2007), p. 22.

15 Ibid., p. 53.