Innovation in the Social Sciences

Sir Roderick Floud

Tonight I will discuss the nature and extent of innovation in the social sciences and in, as an example, my own discipline of economic history. But first I want to place this topic in its wider economic and social context.

Five months ago, two important policy documents were published; they will determine research funding in universities, across all disciplines, in Europe and in Britain, for the next decade.

One was Horizon 2020, the European Commission’s proposal for an investment of €80 billion between 2014 and 2020. The other was Innovation and Research Strategy for Growth, our Government’s strategy for annual expenditure of more than £5 billion.

In both of these documents and in many more, innovation is the name of the game. Innovation is to be the solution to Britain’s, and Europe’s, economic problems in the short and medium term. Innovation is the justification for expenditure on research in universities and research institutes and for the support of small and large firms. Few social scientists would dispute the view that innovation has, particularly during the last three centuries, been an essential component of economic growth and societal change. But the history of innovation, and the history of the study of innovation, should lead us to question whether achieving innovation is as simple a process as governments assume.

Both documents assume that the main task is to stimulate innovation in manufacturing industry. Except for computer games, everything in our Government’s strategy is concerned with making things. And four out of the five key challenges to be met by all Europeans are – if one reads the texts of the documents - about seeking technological or manufacturing solutions to Europe’s problems.

This is surprising. The internationally accepted definition of innovation, the Oslo Manual, adopts a much wider approach.

And the OECD believes that areas of the economy other than manufacturing have been major sources of innovation and drivers of economic growth.

This is because economic growth – over the past 150 years – has seen a declining share of manufacturing and agriculture in the labour force and the overall economy and a compensating rise in the share of services.

In every G7 country today, services account for about 75% of the economy, manufacturing for 20% or less.

This long-term change in the balance of our economies is universally seen as a problem. Our politicians have long bemoaned the decline of manufacturing, seeing it – wrongly – as peculiar to Britain. Now, in a time of financial crisis, they want to "re-balance" our economy and to do so by stimulating innovation in manufacturing.

Opportunities for growth and innovation in services are neglected or disregarded.

This matters. It reduces the search for the solution to problems to mechanical answers. It is as if the only solution to crime is to devise better burglar alarms or the solution to population ageing is to invent better Zimmer frames. Societal problems are likely to need societal solutions, based on clear analysis of those problems by social scientists. Who today, faced with the costs of rail and road construction, traffic congestion, the noise and air pollution around airports and the rising price of oil, seriously believes that the solution to transport problems lies in building better cars, trains or aircraft? Why has this happened? Why, in economies dominated by service industries, do politicians yearn for the golden age of the Industrial Revolution? Why has the rural idyll beloved of the 19th century been replaced by romanticising mill, factory and brickyard?

There are, I think, two principal reasons. The first is an ideology. The second is a problem of measurement.

First, the ideology. It is composed of a number of inter-linked beliefs. The first is a mistaken theory of value. The Physiocrats, a predominantly French school of economists in the 17th and 18th centuries, saw all value as stemming from the land. This economic theory failed to survive the Industrial Revolution, during which the alternative labour theory of value was elaborated, though Adam Smith saw the problems in that.

By contrast, today all market activities are now counted as part of GDP. But physiocracy lives on in the view that value, or wealth, is created only by the making, growing or mining of tangible objects.

Politicians, and many others, consider that manufacturing is wealth-creating, while all other economic activities – particularly if they are in the public sector – are non-productive, wealth-consuming and therefore inferior. This view is remarkably widespread; I remember in the 1990s being assailed by an alliance of the then President of the Royal Society and a Labour MP from a northern industrial area. I had suggested that the service sector also creates value. They found this incomprehensible and offensive.

The second linked belief is held by many natural scientists and engineers. It is the so-called linear model. This
We create and transmit knowledge by teaching, research and publication. Our output is our students, our quantity and its quality. So what is the output of a social science, economic history? What do we do?

The greatest difficulty in describing and explaining innovation and change in services lies in measuring output, its productivity, of services in general and of those in the public sector in particular.

The rise of services as a proportion of national product was therefore attributed not to their efficiency but to the difficulty in measuring productivity, of services in general and of those in the public sector in particular.

The third linked belief is simple industrial romanticism. It echoes the awe and wonder with which the Romantic poets greeted the Industrial Revolution. Making things is exciting, while teaching, caring or serving is not. As the design correspondent of The Guardian recently put it:

The ideology which links these beliefs is a very strong one. It sees the entire course of economic change in all developed countries over the past two centuries as a mistake. That mistake must be reversed by governmental action to stimulate manufacturing – and science and engineering – at the expense of other sectors. If such policies have failed over the past 50 years – as they manifestly have - this is merely a reason for spending even more money.

This ideology has been reinforced by problems of measurement. Although there are still arguments about the sources of value, for all practical and policy purposes we have, since the second world war, measured our economies within the framework of national income analysis. This framework leads to the national accounts, in particular to the calculation of national product (GDP or GNP) or its equivalent, national income. In essence, this framework is based on measuring everything that is bought and sold in the economy and all the incomes that are paid to workers, capitalists and rentiers. If, as happened at the end of last month, it is judged that Britain is once again in recession, that is based on a calculation that national income has fallen.

There are, inevitable, anomalies in such a system. It accounts only for economic activity which is monetised; as a distinguished economist, Jevons, once put it, if I were to marry my housekeeper – and thus stop paying her - national income would fall. But there is also a particular problem of measuring the output, and hence the productivity, of services in general and of those in the public sector in particular.

National income calculations often assumed - in the absence of better information - that the output of a given service was equivalent to the inputs, principally of labour. Thus the output of teachers was assumed to be the same as their wages. This implies that it is impossible for teachers – or doctors, or care assistants – to become more efficient or to improve the quality of what they do. This has made the service sector, and the public sector in particular, an easy target for politicians who argue that services, and particularly non-market services, such as those provided by these caricature public servants, are inefficient compared to manufacturing or the private sector.

It is particularly difficult to measure changes in the quality of services. It was even argued for some time that it was impossible to envisage improvements in the quality of many services. How could one improve on the performance of a Beethoven string quartet? In addition, conventional national accounts did not classify investment in intangible assets, such as software or the internet, as the equivalent of investment in machines. All this led to the conclusion that it is very difficult to achieve increases in productivity through innovation and investment in services.

The reverse, to the allegation that services could not increase their efficiency as rapidly as could manufacturing.

All this has recently been challenged and many conventions of national income analysis have been changed. National statisticians, the OECD and NESTA, the National Endowment for Science, Technology and the Arts, have all improved their estimates of output and investment in services. Economic historians have rewritten the history of the service sector and emphasised its increasing profitability in the twentieth century. Even if services were once thought to be a drag on the economy, they no longer are.

However, even if social scientists now realise that services are central to our economy and to raising productivity, no one else does. Politicians want to “rebalance” the economy. Investment in research is heavily skewed towards medicine, the physical sciences and engineering. The capacity of social science to contribute towards the solution of society’s problems is undervalued. All of this matters, to us as social scientists and as citizens of Britain and of Europe. But what can we do about it? One thing that we can do is to increase our understanding of innovation in general and innovation in social science in particular.

Despite the work of such distinguished economists as Nathan Rosenberg and Paul David and the development of “innovation science”, we still don’t really understand innovation in manufacturing; in services we have hardly begun. However, we have an example close to hand, the social sciences themselves. Perhaps, if we can explain innovation in the social sciences, we can gain some insight into innovation in service industries more generally. We are part of the “knowledge economy”, we are part of the public sector, but we also sell what we produce. Can we gain some insight into output and productivity in services by measuring our service?

The greatest difficulty in describing and explaining innovation and change in services lies in measuring output, its quantity and its quality. So what is the output of a social science, economic history? What do we do?

We create and transmit knowledge by teaching, research and publication. Our output is our students, our
books, our articles and the impact that all these have on others in our profession and in the wider world. Measuring our output of students is difficult because of problems of classification. So I fall back, as so often in universities today, on research.

We can, unusually, measure the amount of research in British economic history published since 1925; from small beginnings, output in 2010 reached nearly 2000 books and articles. Dividing by a rough estimate of the number of economic historians shows, in brief, that they have increased their productivity by seven times, a very creditable achievement, with a particularly rapid improvement in recent years.

At the same time, sales of books on the subject have risen and the leading publisher in the field, Cambridge University Press, now sells £0.5 million of books in the subject each year.

But where has this increase in productivity come from? Has it come from outside or from changes in the way we work – from innovation?

Substantial increases in labour productivity usually occur in the context of technical change. The major technological change which we have lived through is the IT revolution. OECD and NESTA studies both suggest that this is responsible for much of the productivity change that they identify in the services sector as a whole.

The computer is now part of all our personal and academic lives, as much in the social sciences as in other disciplines.

But remember that only 50 years ago, in the early 1960s, the process of calculation had hardly changed since the days of Newton or at least since the invention of logarithms. Mechanical calculators became available during the 1950s. But complex calculations were nearly impossible; an entire summer could be spent calculating a regression with three independent variables.

Economic historians and other social scientists were early, and enthusiastic, adopters of the new technology. We saw the benefits in data capture, in data storage, in data processing and analysis, and in word processing and presentational software. We have recently been reaping the benefits of digitisation and search tools, affecting both primary and secondary sources.

Some examples. In the mid-1960s, I was using the Oxford University KDF9. That computer cost well over £1 million in prices of the day, perhaps over £40 million in today’s prices; its memory was a 10th of that of the iPhone in my pocket. Storage of data was on punched cards or paper tapes; they were laborious to create and lug around and demanded fixed and limited formats.

The advent of data entry terminals in the 1980s, followed by the laptop, began a transformation of data collection; its cost has fallen to a 10th or less of costs in the 1990s. Processing cost and speed has been transformed. We have escaped entirely from the tyranny of “turn-round” time.

There have also been the benefits of improved software. In the 1960s, we had to write our own software to perform operations which now seem trivial, such as sorting data alphabetically; modern package software seems little short of miraculous. We helped, of course, to stimulate the development of the technology and its adaptation to the needs of the humanities and social sciences – I even appeared in an IBM advertisement – but we were primarily grateful - though often frustrated and angry - recipients of an exogenous technological change.

It is impossible to quantify the impact; but it has been transformative. However, it is unlikely that it accounts for all of the productivity increase in our subject. Part of may stem from simply working harder; most academics feel that they have done so in recent decades. But much must be due to our innovations. What have they been and how do we explain them?

First, what is an innovation in an academic discipline?

Here are three possible definitions: (Oslo, Sloboda, Koestler)

For Slobada, almost everything that we do, every book or article, is creative and innovative; it is a catch-all. Koestler requires interdisciplinarity, which is too restrictive. Oslo comes closest to defining what I mean by innovation, a substantial change which sends our subject in a new direction.

But what are its sources and how can it be stimulated? As examples, I will concentrate on three major innovations: national income history, demographic history and anthropometric history, which together have transformed economic history and our knowledge over recent decades.

What were these innovations?

National income history, first, was the application to history of the framework of national accounts which I mentioned earlier. It was primarily the creation of the American economist and economic historian Simon Kuznets. During the 1950s and 1960s a team of economists, mainly in Cambridge, calculated the components and totals of national income, initially back to the early 18th century. Since then estimates have been pushed
back further.

Their work provides an overall framework for the study of the economy, into which all its detailed complexities have to fit.

Population history is my second innovation, rivalling national income analysis in its impact on our understanding of the past four centuries. Although Malthus, at the end of the 18th century, emphasised the close connection between population change and the economy, it was not until the 1980s that we could construct accurate estimates of population change for the years before the first modern census of 1841 and the advent of civil registration of births, marriages and deaths in 1837.

Those estimates were the work of the Cambridge Group for the History of Population and Social Structure, aided by an army of local volunteers. Estimates were made not just for aggregate population change but for its components, in the process revolutionising our view of pre-industrial populations by showing that the primary determinant of population growth in the 18th century was changes not in deaths but in births.

My third example of innovation is anthropometric history, a new branch of historical enquiry to which I have contributed. I mentioned earlier that the national accounts count only what is monetised. Until recently, studies of changing living standards were similarly based only on money, in particular on changes in wages adjusted for changes in the cost of living. Anthropometry, the study of human heights and weights and other bodily characteristics, has given us a new and, as it has turned out, very productive way of describing and analysing living standards in the past; it relies on the fact that average height is a measure of overall nutritional status, including not only intake of food and warmth but also work effort and the effects of disease. Like population history, it has to be consistent with the framework of national income history. This slide shows, as an example, the changing height of the British working class since the Industrial Revolution.

It is no exaggeration to say that, as the result of these three innovations, we now understand the history of the British economy in an entirely different way. These are not the only innovations in the subject, which has simultaneously become less insular, but their impact has been enormous. An academic discipline, a service industry, has been transformed.

What explains these innovations and what lessons can we learn from them? To find out, I’ve interviewed many economic historians and read the thoughts and memories of others.

Innovation involves, I’ve found, teamwork, leadership, argument, money and luck.

First, teamwork. Social psychologists who have studied creativity agree on one maxim: two heads are better than one. Although the popular perception of an inventor, and of an entrepreneur, may be that of a lone individual, most advances have come from teams.

The national income historians made such advances together that they created the framework within which all economic historians now work. Shortly after, the Cambridge Group similarly transformed English demographic history.

Anthropometric history also grew from teamwork. The team was inter-disciplinary, an example of what the great French historian, Braudel, called “inter-science”. The original idea of measuring health by the use of height data came from a demographer; but it required the combined skills of historians, economists, statisticians and human biologists to realise its potential and to grapple with its difficulties. It took several years to understand the implications of anthropometry and to integrate the work of scholars such as David Barker on the infant origins of adult health or Hans-Theodore Waaler on height, weight and mortality.

Teamwork is particularly important in interdisciplinary work. It is extremely difficult for one person, or even a team which got on as well together as did the early anthropometricians, to master the breadth of relevant literature. It requires intense discussion truly to understand the preconceptions and methods of another discipline. I often recalled the words of my supervisor, H.J. Habakkuk: “One man cannot think in two ways” but concluded that it was a team that made it possible.

Second, leadership. This was particularly important in demographic history, where Peter Laslett and Sir Tony Wrigley were the risk-taking entrepreneurs. In anthropometric history, the team was created by Bob Fogel, who was later to win the Nobel Prize for his intellectual innovations and leadership. Leadership became increasingly important as data sets and research teams became larger. Bob Fogel speaks of spending half his time raising funds. But leadership of the kind displayed by Fogel is much more than that of writing grant applications – the leader has, above all, to choose team members who can work with each other.

Third, argument. Innovation brings and stems from controversy. As Schumpeter emphasised when he spoke of “creative destruction”, an innovation implies the overturning of an old paradigm; often, if not always, this is resisted.

Historical national income analysis was the least controversial of the four innovations, although some doubted whether the Department of Applied Economics in Cambridge should be wasting time and money on history. But
the other three were very controversial. The whole concept of quantification in economic history was controversial, as was the similar “quantitative turn” in other social science disciplines. In its early years, the disputes were between the cliometricians and the old guard – who tended to resent being called that. Counterfactual analysis was derided. The cliometricians were not easily cowed;

Bob Fogel put his years of training as a communist student organiser to good use and recalls that he approached his critics like “Lenin confronting the Mensheviks.” But he was not the only one who saw the quantitative economic history as akin to a crusade.

Anthropometrics was met with incredulity if not derision. I wasn’t terribly surprised, since my own initial reaction – when Bob Fogel asked me to work with him – was one of scepticism. However, the reaction of economists and historians taught me that interdisciplinary research demands a thick skin. I was told by economists that anthropology could tell us nothing about living standards, which were defined solely by real wages. Historians insisted that any change or difference in height was genetic – 100 years of debate about nature and nurture had passed them by. Only among human biologists did I feel welcome. Times have changed and anthropometry is now seen as part of our tool-kit.

Fourth, money. It is a myth – one in which social scientists as well as humanities scholars have been complicit – that research in our disciplines is cheap. “All I need is time”, people say, forgetting that they also need a salary, a room, a 500 year old library and access to the internet. All four innovations have been expensive; they required long-term investment and support from research councils and universities.

The unsung heroes of innovation in economic history are the Research Councils. It required imagination and faith to invest as heavily as they did, in both the UK and the US; they supported young scholars without track records and continued to support innovative research as it became more and more expensive. Committees of the SSRC, now ESRC, were important supporters, while in the United States this role was played by directors at the National Science Foundation and the National Institutes of Health and Ageing. All were attacked for wasting public money on social science at all, let alone history. Bob Fogel's initial grant for the Union Army research was derided in the New York Times, only nine months before he became the first of the National Institutes of Aging’s grant-holders to win the Nobel Prize. The European Science Foundation and the European Commission and its European Research Council have faced down similar criticism.

Fifth, and finally, luck. Bob Fogel puts it: “You’ve got to be lucky.” Luck is often crucial in framing questions and in finding data. Isaac Asimov once wrote that: “The important words in science are not ‘Eureka’ but ‘that’s funny’”; it is the mould on a culture that changes the face of science. In historical fields, the chances of data discovery are crucial.

As important, however, is “that’s funny.” Fogel and Engerman’s work on slavery stemmed from a back-of-the-envelope calculation to work out exactly how inefficient was slave labour, which came out with the “wrong” answer. Seminal work on the industrial revolution began when an economist, Nick Crafts, couldn’t reconcile some inconsistencies in earlier accounts of national income. Douglass North, the other economic historian to win the Nobel Prize, began to realise that Chicago neo-classicism did not give him the tools he needed. As one leading historian puts it, one gets a niggling sense that one could do better.

No-one mentions a “Eureka” moment. I do remember several “how could I have been so stupid?” moments, usually about mistakes in coding or analysing data. Perhaps because data collection takes a long time, innovation seems to proceed by the slow accretion of knowledge rather than by sudden insights.

Enquiry is often stimulated by a chance remark by a colleague over coffee. Many attribute much of their work to suggestions from others.

Peer support and encouragement, as well as criticism, are crucial; as one of my colleagues puts it, “we should flatter each other more.” The basis for peer support is, however, expertise and much recent innovation may be down to improved graduate training.

Teamwork, leadership, controversy, money, luck and peer support seem to be the main drivers of innovation in our subject and, probably, in the social sciences in general. Together, they enabled us to take advantage of the changes in our technology from the IT revolution. And there is no sign of innovation failing.

What conclusions can we draw for the future of our subject and for public policy on research and innovation?

First, we must constantly emphasise that we have to deal with the economy as it is, not hark back to some mythical golden age of happy mechanics. It is possible – we have demonstrated it for decades – for an economy to be dominated by services and for those services to become more efficient and innovative.

Second, just as the service sector of the economy as a whole demonstrates that it can innovate and raise its productivity, so too can social science. The social sciences and humanities are not some backwater, the haunt of lone scholars skulking in libraries; they are, instead, at the forefront of the IT revolution. They have a great deal to contribute to solving problems which are not simply mechanical, the preserve of manufacturing or the physical or engineering sciences.
Let me return, for one moment, to Horizon 2020.

All the challenges for Europe which the EC has identified will be solved by political and social action. Technology can contribute, of course, but who can deny action to combat climate change, or to deal with an ageing population, will require political decisions, informed by social science.

Third, it follows that the social sciences can and must demand a fair share of the research funds which will be devoted to these challenges. Research in economic history and the social sciences will become more costly, as we continue to exploit larger and larger data sets and to explore the implications of network analysis and advances in human biology and neuroscience. We can demonstrate that investment in these fields, and in the infrastructure and facilities that they need, will pay off. Like scientists in other fields, we need research grants, we need conferences and networks, we need IT.

Fourth, we need to redouble our efforts to understand innovation in general and in the service sector in particular. We, like the rest of society, must escape from the mind-set which privileges the making of things. We must study the media and creative industries, the services and professions, health and welfare, as intensively as – in the past – we studied machine-tools, mines and railways.

Fifth, we must better publicise what we know and how we have found it out. Historians are often the last people to advocate learning from history; they know how difficult it is to understand the past. But the only proper response to the wilful, and damaging, failure of our politicians currently to understand the realities of the development of our economy over the last two centuries and in particular to appreciate the lessons of the last great depression is to redouble our efforts to educate them. Public engagement, as I’m sure Sir Thomas Gresham believed, is the only way to combat ignorance.