The Importance of the Social Sciences for the Industrial Strategy

Introduction

Industrial Strategy Overview

The Government's Industrial Strategy (IS) aims to improve and prepare the UK economy for the future by maintaining high levels of employment while raising productivity.[1] The intent is to improve productivity across the country by addressing the 'foundations of productivity,' identified in the 2017 IS White Paper as:

- **Ideas** (R&D, innovation)
- **People** (skills and education)
- **Infrastructure** (broadband, energy, transport)
- **Business Environment** (support for specific sectors and SMEs)
- **Places** (tackling regional disparities).[2]

In addition to a series of policies focused on bolstering these foundations, the IS also announced that significant research and development (R&D) spending will now be concentrated around four Grand Challenges that 'put the United Kingdom at the forefront of the industries of the future.'[3] The White Paper set these Grand Challenges as:

- 'artificial intelligence and big data;
- clean growth;
- the future of mobility;
- and meeting the needs of an ageing society.'[4]

The 2016 Autumn Budget had already included an additional £4.7 billion for R&D over the four-year period to 2020/21.[5] Around the same time as the Industrial Strategy was announced, the Government further committed the UK to raising its total R&D spending by 2027 to 2.4% of UK GDP.[6] To achieve greater R&D investment focused on the aims of the IS, a series of special funds were announced, including

the Investment Fund (incubated within the British Investment Bank), the National Productivity Investment Fund, and, perhaps most important to this discussion, the Industrial Strategy Challenge Fund and the Strength in Places Fund.

The Industrial Strategy Challenge Fund (ISCF) provides funding and support to UK researchers and businesses working on specific Societal and Industrial Challenges. These will be identified in waves, and are meant to be in-line with the overall Grand Challenges of the IS.[7] The first wave of challenges was allocated £1 billion in funding (2017/18) and the second £725 million (2018/19). The third wave of submissions has now been closed[8] with announcements due later this year. Thus far, the 15 identified challenges appear largely STEM-focused,[9] though many benefit from social science partnerships.

Similarly, the Strength in Places Fund (SIPF) led by UK Research & Innovation (UKRI) is intended to support research and innovation to spur regional growth. Out of the 24 projects awarded seed-corn funding in the first wave in March 2019, 20 were mainly STEM-focused. Yet social science is vital to developing economic and business growth models that work in relation to the communities around them, and for ensuring that technological and scientific innovations are successfully disseminated and put into practice in local economies and markets. Social science is also vital for understanding not only the role of 'place' in projects from all disciplines, but also how to transport and translate lessons of what works to create innovation-led growth in one location, sector, or type of activity to another.

The Role of the Social Sciences

The social sciences are vital to achieving many of the aims of the industrial strategy. Good social science has helped to shape, define and diagnose the issues underpinning the industrial strategy and what may need to change in the future. For instance, it can also help in understanding and changing the wider social conditions – education, skills and social investments – within which any successful industrial strategy can be advanced. This includes not only understanding individual and social behavioural change associated with new technologies and industries, but also the changes in social institutions and infrastructure needed to promote adaptation and further cycles of innovation and growth.

This paper begins by setting out how the Industrial Strategy White Paper was itself shaped by social science. It provides examples of social science research on issues relevant to industrial strategy that are fundamental to understanding how, for instance, to improve productivity and growth. To retain focus, we do not seek to cover issues like health, ageing, and inequality here, although it is clear that social science work is vital to understanding these important issues that also undoubtedly affect economic growth and productivity over the long term.

This paper then presents some of the strongest case studies the Campaign for Social Science has gathered from its member Learned Societies and Fellows, showing the various ways that social scientists have contributed to current thinking on the industrial strategy through their descriptive or diagnostic work. We also provide some examples of social science-led interventions or experiments that have helped drive change by, for example, suggesting changes in the incentives, structures or behaviour of governments, schools, firms and individuals. These are of course only examples, but they show that the

social sciences have contributed to work that is directly relevant to industrial strategy in its widest sense, as well as in more concrete ways.

It is, of course, important to note that in addition to the case studies in this paper there are centres at UK universities with programs of important social science research on just these issues – like the Science Policy Research Unit (SPRU) at the University of Sussex, and UCL's Department of Science, Technology, Engineering and Public Policy (STEaPP) or the Institute for Innovation and Public Purpose (IIPP) – to name but a few. While these represent important investments[10] in vital research, we focus here on discrete examples of research or research programs, with publicly available information on impact. Similarly, we have not included case studies on significant newer research ventures that have not yet had the time to generate the type of impact discussed in this paper. For example, the Productivity Insights Network being led University of Sheffield Professors Philip McCann and Tim Vorley is bringing together an impressive number of academic and private sector thought leaders to crack the UK's productivity puzzle with key funding from the ESRC. These are welcome developments, but not included in the case studies here because it takes time to demonstrate impact.

We have found fewer case studies based on interventions or social experiments than we would like, highlighting an opportunity for future work. One powerful contribution that social science can make is to engage in this sort of work, with well thought-out evaluations, to show what sorts of interventions will most effectively promote change. This is as true of policies aimed at effecting the behaviours of businesses or firms – to make longer-term investments, make better use of R&D, or to promote more rapid diffusion of innovation – as it is for individual-level change. This would of course require strategic programmes of work to address the sorts of issues not easily linked to the commercialisation agenda of specific technologies. Creating centres or networks to carry out intervention studies to drive change could be a powerful way forward, working with particular sectors or types of firms, or in particular areas. We have examples of some of this sort of work in a number of the case studies we have compiled, but few based explicitly on a model of experiment and evaluation.

We have compiled these exemplary case studies to show what the social sciences have already contributed to industrial strategy and productivity. We also hope this report will stimulate wider conversations about what sorts of work it might do in future. We know there are various initiatives underway, for instance, to look at challenges and changes to transform productivity for small businesses. But we hope these case studies of recent research help demonstrate that the social sciences have a vital contribution to make.

Part I – How Social Science Shaped the Industrial Strategy: Framing our Understanding of Productivity, Innovation, & Growth

The Industrial Strategy draws heavily on social science research to support and develop its approach to driving innovation, raising productivity, and increasing growth. Before moving on to the case studies, we

felt it would be useful to highlight some of the social science research referenced directly in the Industrial Strategy itself.

In the Industrial Strategy, for example, the UK government adopts what has come to be known as a *mission-oriented* approach to the economics of innovation, building on the seminal work of the economist Professor Mariana Mazzucato FAcSS. Mazzucato's research, encapsulated in the book *The Entrepreneurial State*, 'has debunked myths of the state's role in the economy as [one of] simply "fixing" market failures, or … "facilitating" innovation' – showing instead that 'the ways in which the state has, through the direct funding of high-risk areas and mission-oriented planning, provided the courageous, high-risk investments that have led to the development of new technologies and sectors.'[11] Mazzucato's research has been influential in the development of innovation and industrial policy in the UK and the EU for some time,[12] and has been pivotal in the development of the next EU framework programme, Horizon Europe, which is also taking a 'mission-oriented approach.'[13] It is perhaps not surprising, therefore, that the Industrial Strategy White Paper specifically cites Mazzucato when it argues that the UK will 'develop *missions* to tackle the grand challenges' that will focus on 'tackling specific problems, such as reducing carbon emissions.'[14]

The industrial strategy also references the work of several other social scientists, such as that of Professors Nick Bloom (Stanford) and John Van Reenen (originally LSE, now MIT). Working with McKinsey & Company, LSE's Centre for Economic Performance, and researchers from other universities, Bloom and Van Reenen developed the first comprehensive global survey and database of management practices of its kind, across four industries in 35 countries, in order to be able to measure the relationship between specific management practices and productivity. Their work not only shows that good management practice is strongly associated with productivity, but also that 'the overall performance of most countries is determined not by the performance of its leading companies, but by the size of its "tail" of poor performers,'[15] an issue the UK has long struggled with.[16] Even before the Industrial Strategy, the UK government was reported to be 'using the findings' of Bloom & Van Reenen's work 'to identify policies to support management' and to share those 'with UK firms …result[ing] in training schemes to raise management education.'[17] It is, again, perhaps unsurprising that the Industrial Strategy White Paper specifically cited the findings of Bloom & Van Reenen's work – namely 'that the average UK manager is less proficient than many overseas competitors' and that 'management skills could account for a quarter of the productivity gap between the UK and the US'[18] – in order to help identify the challenges ahead and highlight the role that the expanding the diffusion of good management practices to the UK's 'long tail' of underperforming companies will need to play in improving UK productivity.

Fundamental to the industrial strategy is the drive to create prosperous communities *across* the whole of the UK and to tackle regional disparities. The White Paper uses social science research from Professors Ron Martin FAcSS (Cambridge), Andy Pike FAcSS (Newcastle University), and Pete Tyler FAcSS (Cambridge) to argue that the Industrial Strategy's city, growth, and devolution deals are needed to rebalance the economy because 'the UK has greater disparities in regional productivity than in other European countries.'[19] Other social science research has also clearly been influential in developing government thinking and affecting government policy in this area. Researchers at Middlesex University, for example, had a decade earlier 'demonstrated the need for a greater focus upon enterprise and jobs

at a sub-regional level and improved co-ordination and integration of governance arrangements in order to tackle this issue.'[20] Researchers at LSE have also 'made direct contributions to government thinking' that have contributed to 'the Government's shift from regional to city policy-making' leading to the abolition of the Regional Development Agencies' and to the 'establishing Local Enterprise Partnerships [LEPs] and bespoke "City Deals".' [21] Social science research has also demonstrated that, for the industrial strategy to truly take account of regional differences, it must to do more than just increase regional funding – it must also bolster those industries within individual regions that can further drive growth and productivity. Research on 'City Evolutions,' led by Prof. Ron Martin and funded by the ESRC, analysed productivity growth across 85 British cities from the early 1970s onwards in an effort to understand the degree to which their differing rates of productivity were due to 'changes in the cities' economic structures.'[22] That research found that regional differences in UK productivity 'are primarily caused by productivity developments *within* industry sectors, more than by overall structural change.'[23]

Case Studies

The above are just a few of the examples of social science research that have clearly had a direct effect on the Industrial Strategy White Paper. Yet it is clear that there are many more cases of social science research that have helped to frame the debate and current thinking on issue areas addressed in the Industrial Strategy, and which continue to do so. For this reason, the next section provides a number of case studies of social science research that have had clear impact in areas relevant to the Industrial Strategy. Each one highlights the relevant 'Pillar' of the Industrial Strategy or Grand-Challenge (in writing and as denoted by the icons in the top right hand corner), as well as the impact/issue areas that are related to these. Case studies are also color coded, to show which are examples of policy interventions or experimentation (purple), systematic reviews (orange), descriptive & analytical research (green).

Key to Case Study Research Type

Policy Interventions & Experiments | **Systematic Reviews** | **Analytical & Descriptive**

Key to Industrial Strategy Icons

PILLARS

= **Ideas** (R&D, innovation)

= **People** (skills and education)

= **Infrastructure** (broadband, energy, transport)

= **Business Environment** (support for specific sectors and SMEs)

= **Places** (tackling regional disparities)

GRAND CHALLENGES

= AI & Big Data

= Clean Growth

= Future of Mobility

= Aging Society

1. What Works Centre for Local Economic Growth
Evidence Review on Innovation

IS area: Ideas, Places
Impact focus: Innovation, Local Economic Growth, R&D
Social Science: Economics

The What Works Centre for Local Economic Growth is part of the wider UK What Works Network, established to help improve the use of evidence in policymaking. As part of its remit, it conducts systematic reviews of existing evidence in important policy areas to support policymakers and ensure 'more efficient and effect' delivery of public services across the UK.[24] Its systematic Evidence Review on Innovation examined about 1,700 pieces of research 'from the UK and other OECD countries evaluating the impact of innovation policies.'[25] The two-part review focused on the areas of R&D policy with the 'most evidence of impact:' 1) subsidies, loans, and grants and 2) tax credits.[26] Its findings provided important insight for policymakers ahead of the formulation of the industrial strategy, suggesting that they should be cautious about 'the role that localised innovation policy should play in driving local economic growth' and 'strengthening the case for national co-ordination' of innovation policies.[27] This was because while the review found that 'policy initiatives are shown to increase R&D activity,' it also found that 'there is not much evidence on how much this in turn affects innovation, firm performance or economic growth', and that 'innovation impacts may also spill over across local boundaries'.[28] Moreover, the review found that 'local R&D support programmes could also result in inefficiently high levels of support if footloose firms are able to extract more generous support from competing local areas regardless of any net beneficial impact.'[29]

Institutions: What Works Centre for Local Economic Growth
Notable Funders: ESRC, BEIS, and the Department for Communities and Local Government.
Lead researcher: Professor Henry Overman
Case Study Source: https://esrc.ukri.org/news-events-and-publications/evidence-briefings/finding-effective-innovation-policies-for-local-growth/

2. Catapult Centres

IS area: Ideas
Impact focus: Innovation, Commercialisation of Research
Social Science: Business & Management Studies

Research led by Professor Alan Hughes, with key research by A. Mina and D. Connell at Cambridge's Centre for Business Research (CBR) was central to the creation of the UK's Technology Innovation Centres (TICs) that have become today's network of *Catapult Centres*, helping to bring innovative research to market. 'A long-running programme of research on the determinants of innovation performance across firms and nations and university industry knowledge exchange has been undertaken at the CBR since 1994.'[30] This work 'led to a specific international comparative case study … which showed that successful intermediate technology and innovation centres combined a number of key characteristics … includ[ing] medium to long-term public sector development funding of platform technologies with the capacity to develop multilateral and bilateral private sector co-funding to enhance the quality and speed of commercialisation from the science base.'[31] This research informed 'the 2010 Hauser report, which advocated the establishment of Technology Innovation Centres (TICs), and played a central part in subsequent discussions and decisions about the realisation of the report into legislation.'[32] There are now ten Catapult Centres with a mix of commercial and government funding (through Innovate UK), focussing on: Cell and gene therapy, Compound semiconductor applications, Digital, Energy systems, Future cities, High value manufacturing, Medicines discovery, Offshore renewable energy, Satellite applications, and Transport systems[33]

Institutions: Centre for Business Research (CBR) at University of Cambridge
Notable Funders: Cambridge, EPSRC Cambridge Integrated Knowledge Centre in Photonics and Electronics
Lead researcher: Professor Alan Hughes
Case Study Source: https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=16712

3. Responsible Innovation Framework

IS area: Ideas
Impact focus: Innovation
Social Science: Business and Management Studies

Encouraging and enabling innovation is a key tenet of the Industrial Strategy because of its potential to create economic growth and improve lives, but innovation is also 'a powerful, uncertain and unpredictable activity that produces … ethical dilemmas and impacts that can be global and intergenerational in nature.'[34] Responsible management of innovation is, however, possible – and the research of Professor Owen and his team focuses on the development of a framework for responsible innovation that can be used by organisations overseeing these activities, – allowing them to understand 'how responsibilities are perceived and distributed' and to 'proceed in a manner that is socially desirable and acceptable', while operating 'under conditions of ignorance and uncertainty'.[35] 'This emphasis on practice has led to a number of implementation experiments at the Research Councils and Technology Strategy Board (e.g., nanotechnologies, synthetic biology), and most recently in financial institutions (e.g. new financial product development department at Fidelity International Asset Management). A further EPSRC grant provided an opportunity to research the framework's application in the contentious field of climate engineering, demonstrating its broad application.' [36] The Responsible Innovation Framework has had a clear impact on innovation policy in the UK and EU, being adopted as 'a central element of EPSRC's research policy', and providing 'important input into a restructuring by the European Commission of the European Research Area, underpinning its Horizon 2020 Strategy and Innovation Union.'[37]

Institutions: University of Exeter
Notable Funders: ESRC, EPSRC, EU FP7
Lead researcher: Professor Richard Owen
Case Study Source: https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=38968

4. The Enterprise Research Centre

IS area: Ideas, Business Environment
Impact focus: Innovation, Productivity, SMEs
Social Science: Business and Management Studies

The work of the Enterprise Research Centre (ERC) focuses on 'explaining the factors which drive innovation, growth and productivity in small and medium-sized enterprises (SMEs).'[38] Research led by Professors Hart and Roper has made the ERC 'the "go to" place for a wide range of UK and international policymakers and practitioners for intelligence on SME growth and performance. For example, by producing the Local Growth Dashboard and Benchmarking Local Innovation reports for Local Enterprise Partnerships (LEPs) and the Devolved Administrations, it provides robust evidence against which the impact of policies which affect SMEs can be monitored. ERC also organises an annual 'State of Small Business Britain' conference to disseminate its work to a very diverse set of stakeholders.'[39] The ERC also 'continue[s] to inform the work of policymakers in Whitehall on how best to support ambitious and fast-growing small firms across the UK.' This includes their work 'demonstrat[ing] the irrelevance of HGFs as defined by the OECD to solving the productivity puzzle in the UK.'[40] ERC research 'on firm growth and productivity has led [them] to be invited to be members of the Ministerial Steering group for the "Long Tail Productivity Review".'[41]

Institutions: Aston Business School and Warwick Business School
Notable Funders: ESRC, BEIS, the British Business Bank, Innovate UK and the IPO
Lead researchers: Professor Mark Hart and Professor Stephen Roper
Case Study Source: https://charteredabs.org/publications/revealing-the-factors-which-drive-innovation-growth-and-productivity-in-small-and-medium-sized-enterprises-smes/

5. Spatial Modelling & Retail Network Research

IS area: Business Environment, Ideas, Places
Impact focus: local economy
Social Science: Geography

Spatial interaction modelling research undertaken at the University of Leeds' School of Geography (SoG) has led to a successful spin-out company (GMAP ltd) and models that support businesses and public service providers to make decisions about where to locate and how to improve the effectiveness of their retail/service networks. The research focused on three fundamental areas: 'a) network optimization algorithms; b) analysis of long-term retail market trends; and c) geodemographic classifications of population and consumer behaviour.'[42] A number of private sector 'companies including Ford, Exxon, HBoS and Asda-Walmart have used this software for a range of purposes including maximizing individual stores' profitability and reconfiguring entire networks to fit changing market conditions.'[43] But the research has also had important public sector applications, with 'government agencies … [using] the software to optimize resource allocation in policing, education and healthcare.'[44] The team, for example, worked with the Post Office before privatization to 'improv[e] decision-making and enhanc[e] access to products in a network which serves more than 20 million customers every week, [reducing] costs in a network with an annual government subsidy of £150M.'[45] Working with the ONS, the researchers also 'developed an Output Area Classification (OAC) … capable of appraising customer behaviour according to the demographic characteristics of residential neighbourhoods, as well as other potential applications for service providers' – used, for example, 'by South Yorkshire Police to profile the victims of crime and anti-social behaviour to inform neighbourhood profiling strategies.' [46] This is one of a range of studies that show how important social science work in population and demography can be to public and private sector innovations, and how funding and development of 'translation' mechanisms to make data more accessible and intelligible, can be beneficial to the UK economy.

Institutions: School of Geography, University of Leeds
Notable Funders: GMAP ltd. (a spin-out company of the University of Leeds)
Lead researcher: Professors Mark Birkin and Graham Clarke
Case Study Source: https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=6354

6. Increasing Inward Investment to London through a Spatial Decision Support System (SDSS)

IS area: Business Environment, Place
Impact focus: Local Economic Growth
Social Science: Business & Management Studies

In order to increase investment into the city, this project aimed to support potential inbound investors to make decisions about where to locate their business by providing them with better tools and information to do so. This six-year research project involved a partnership between the researchers and Think London (the Inward Investment Agency for the capital) through its Knowledge Transfer Partnership. It led to the creation of a Spatial Decision Support System (SDSS) that 'coupled management- and decision-science expertise with GIS technology' allowing Think London 'to offer its clients across the world enhanced location analysis to support business needs, [and] to help make a stronger business case and to facilitate relocation to London.'[47] This decision system contributed to approximately '45% of 600+ successful completions, leading to the creation or retention of over 18,000 new jobs and the contribution of £2 billion to London's economy. Among the hundreds of successful outcomes was the establishment of Microsoft's Search Technology Centre in London.'[48]

Institutions: University College of London
Notable Funders: ThinkLondon KTP and the EPSRC
Lead researcher: Dr David Chapman and Patrick Weber
Case Study Source: https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=34498

7. Improving Growth & Performance of Technology-focused SMEs

IS area: Business Environment
Impact focus: SMEs
Social Science: Business & Management Studies

Building on Professor Jack's longitudinal and collaborative research into the role of networks in entrepreneurship, the *Innovation, Design, Entrepreneurship and Science* (IDEAS) programme was developed at Lancaster University's Institute for Entrepreneurship & Enterprise Development (IEED) to help improve the performance of technology-focused small- and medium-sized enterprises (SMEs). The IDEAS programme was piloted in the Daresbury Science and Innovation Campus (DSIC, now named Sci-Tech Daresbury and designated as a flagship Enterprise Zone by the UK Government), working with 60 tech-focussed SMEs 'to explore how they could be supported to facilitate growth.'[49] Jack's research 'suggested that digital or technology-focused SMEs rarely used their available networks or concentrated on areas such as marketing but were instead very R&D focused.'[50] IDEAS used these insights to offer 'a series of research led workshops … designed to increase participants' awareness of their potential networks and their ability to use them effectively … to create sustainable change within their businesses.'[51] The pilot's success (it exceeded targets, creating 55 jobs and saving 10) led to a further '£13.1m of funding for new regional, national and international programmes to support a further 2,900 SMEs.'[52] By 2014, IDEAS had 'worked with 320 SMEs [in the Northwest] and safeguarded 300 jobs and created 180 new jobs', generating £15.80 for the regional economy for 'every £1 invested (in the projects)'.[53]

Institutions: The Institute for Entrepreneurship & Enterprise Development (IEED) at Lancaster University
Notable Funders: European Regional Development Fund, Northwest Regional Development Agency, Lancaster Uni.
Lead researcher: Professor Sarah Jack
Case Study Source: https://ref2014impact.azurewebsites.net/casestudies2/refservice.svc/GetCaseStudyPDF/43594

8. Strategy Brings Record-breaking Investment to Birmingham

IS area: Business Environment, Place
Impact focus: Local Economic Growth
Social Science: Business & Management Studies

Building on over 20 years of research on inward investment, Professor Driffield's assistance in 'developing Greater Birmingham's inward investment strategy helped the area become one of the most successful in Europe for attracting business investment.'[54] His research looks at 'how inward investment in areas benefits the host country', and for example included an £90K ESRC grant that focused on 'maximising the benefits of inward investment' and 'how best to target limited funds' in that context.[55] Such work has enabled Professor Driffield's to provide 'crucial insights' in the form of practical and strategic advice to local government in their efforts to attract inward investment to their region. Specifically, he worked 'through the Greater Birmingham & Solihull Local Enterprise Partnership (GBSLEP) and with Marketing Birmingham (set up by the local council to promote inward investment),' to help 'develop an inward investment strategy that has attracted £150 million' between 2015 and 2017.[56] Moreover, 'his work with UK Trade & Investment (now the Department for International Trade) and business investment agencies to identify foreign firms with a high probability of expanding internationally helped attract six firms to the UK, employing almost 10,000 people to date. His research on the likely impact of Brexit on inward investment has informed the CBI (Confederation of British Industry), sectoral bodies, professional service firms, as well as the Government and investment promotion agencies.'[57]

Institutions: Warwick Business School, Aston Business School
Notable Funders: ESRC
Lead researcher: Professor Nigel Driffield
Case Study Source: https://esrc.ukri.org/news-events-and-publications/impact-case-studies/strategy-brings-record-breaking-investment-to-birmingham/

9. Improving Productivity of Manufacturing SME's in the Northwest's using the Liverpool Agility Method

IS area: Business Environment, Ideas, Place
Impact focus: Productivity, Local Economic Growth
Social Science: Business & Management Studies

Research undertaken by University of Liverpool Management School's Operations & Supply Chain group between 1999 and 2013 into organisational and supply chain 'agility' and responsiveness led to the creation of the Liverpool Agility Method (LAM) designed to put their research insights into practice. The underpinning research examined how to 'harness organizational resources to respond to the uncertainty of a volatile business environment. Agility … provides the means to being able to align production with demand, and … [increase] production and delivery of products to customers in response to changes in customer demand.' [58] Their work 'has provided significant new thinking concerning the design of agile organisations and supply chains,' as their Liverpool Agility Method aids 'the development of SME-focused, resilient business strategies. Since 2008, the application of the research has supported the Future North West regional productivity strategy for the North West of England through the implementation of a wide range of economy-driving and productivity-enhancing industrial applications. These applications have: boosted the region's economy and the prosperity of its citizens; facilitated the growth of the region's manufacturing SMEs; supported the participation of SMEs in global networks; and equipped SME owner-managers with the knowledge and skills to facilitate business growth; improved the professional behaviour and cognitive characteristics of employees, and led directly to 117 jobs and several businesses safeguarded, and 31 new jobs created.'[59]

Institutions: University of Liverpool Management School
Notable Funders: EPSRC, ERDF, NWDA, EC FP7
Lead researchers: Boughton (1996-2003); Ismail (1990-present); Kehoe (1985-2008); Lyons (1999-present); Michaelides (2008-present); and Sharifi (2003-present)
Case Study Source: https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=3946

10. Impact of Glasgow's Night-time Economy

IS area: Business Environment, Place
Impact focus: Productivity, Local Economic Growth
Social Science: Business & Management Studies

In 2015-16 the Moffat Centre conducted the first major study of the value of the Night Time Economy (NTE) in Glasgow. The 'Glasgow Chamber of Commerce commissioned the research on behalf of the City Council, which [then fed] into the five-year City Centre Strategy aimed at ensuring Glasgow remains one of the top city centres and urban tourism destinations in Europe.'[60] The research incorporated a calculation of the economic impact of the evening economy from 18.00 to 6.00am (GDP and GVA) and also considered employment in the various elements of the sector. The research methodology involved a major intercept study with consumers, and stakeholder interviews with owners and operators. The results have been used to inform and help debate on policy of the city in respective of licensing, policing and even emergency ambulance services. This study is fundamentally important for city competitiveness since the vibrancy of the NTE can contribute significantly to the tourist appeal of destinations. The results have been used to inform policy about the growth of retail, transportation and the retail-based redevelopment of the Queen street station terminus.

Institutions: Moffat Centre for Travel and Tourism, Glasgow Caledonian university
Notable Funders: Glasgow Chamber of Commerce
Lead researchers: Professor John Lennon
Case Study Source: https://www.moffatcentre.com/whatwedo/currentprojects/glasgowsnight-timeeconomy/

11. New Ideas for Local Economic Growth

IS area: Places
Impact focus: Local Economic Renewal and Regeneration
Social Science: Business & Management Studies

Enfield Borough Council in London approached researchers from the ESRC Centre for Research on Socio-Cultural Change (CRESC) 'to help formulate ideas for revitalising the borough's economy,' following an 'well-publicised' 2009 CRESC research paper.[61] CRESC research had shown that regeneration strategies could use 'an alternative business model that focuses on re-localisation and greater entrepreneurship within the community', rather than the traditional emphasis 'on enhancing local competitiveness with training programmes and infrastructure improvements to attract investment.'[62] Specifically, the CRESC approach placed 'an emphasis on engagement with utility companies and other major local employers to help re-build local skills and supply chains.'[63] After conducting local research and working with the Borough, CRESC made 'eighteen recommendations … in 2011 for significant strategic and policy changes.'[64] These led directly to 'two new job creation partnerships' with British Gas and Thames Water, whose 'investment in the modernised Lee Valley sewage treatment plant' [included] link-initiatives to boost local recruitment and retain jobs.'[65] Moreover, 'negotiations with utility companies led to British Gas providing over £10 million for social housing insulation upgrades in Enfield', with 'a new insulation manufacturing operation starting up in the borough, creating 50 manufacturing jobs and a further 250 posts for installation professionals. A portion of local authority pension funds was [also] re-invested into social housing in North London boroughs to address chronic housing shortages – at the same time stimulating local construction employment. [In all,] the New Directions job generation scheme is estimated to have created or protected nearly 150 local jobs.'[66]

Institutions: Centre for Research on Socio-Cultural Change (CRESC), University of Manchester; Queen Mary School of Business and Management
Notable Funders: ESRC
Lead researchers: Professor Karel Williams, Professor Sukhdev Johal
Case Study Source: https://esrc.ukri.org/news-events-and-publications/impact-case-studies/local-jobs-boost-from-partnering-with-business/; http://charteredabs.org/publications/new-directions-local-economic-renewal/

12. Leadership Skills Development for SMEs

IS area: People, Business Environment
Impact focus: Skills, Productivity, SMEs
Social Science: Business & Management Studies

Research from the Lancaster University Management School (LUMS) led to the creation in 2004 of the Leading Enterprise and Development (LEAD) programme, which has led to 'increased … productivity and sales of [each of the roughly] 250 local companies' it had worked with by 2013.[67] Run by LUMS' Institute for Entrepreneurship and Enterprise Development, LEAD 'is a leadership development programme for small business owner-managers, … [which] enables entrepreneurs to work on their businesses through a series of workshops, master classes, lectures and networking events. LEAD provides a framework to increase profitability, innovate and grow the business[, focusing] on two areas of the business: the business itself and the personal development of the owner-manager.'[68] The evaluation of LEAD showed that after participation in the programme, the '251 SME owner managers show[ed] average increases in sales turnover of 37.5% attributed to the programme, increases in employment of 5.7 persons, and mean employment growth p.a. of 16.8% – as well as improvements in productivity and mind-set changes amongst the managers involved.'[69] Following its successful pilot at Lancaster, the programme has successfully 'operated in a number of [other] locations in the UK', including 'at Liverpool, Swansea, Cheltenham and Bangor' universities.[70]

Institutions: Institute for Entrepreneurship and Enterprise Development, Lancaster University Management School
Notable Funders: ESRC
Lead researchers: Professor Mary Rose, Dr Eleanor Hamilton
Case Study Source: https://esrc.ukri.org/news-events-and-publications/impact-case-studies/helping-small-business-grow/

13. Restructuring Vocational Education and Training

IS area: People
Impact focus: Skills
Social Science: Business & Management Studies

'Vocational education and training in England have been comprehensively restructured as a direct result of research by the King's College London Department of Management's vocational training group' led by Professor Wolf.[71] Research undertaken between 2003 and 2011, showed that the 'tax and subsidy interventions intended to enhance skill development' and the 'centralised design of publicly funded training programmes' that had formed 'the single most important component of [UK] productivity policy for many years', needed to be rethought.[72] Their research, for example, 'demonstrated, through original analysis of national longitudinal databases, that researchers and policymakers, internationally and nationally, have been mistaken in assuming that all formal accreditation of skills is likely to have positive human capital and earning outcomes', and 'that the government-directed shift away from often non-accredited, but employer-run, apprenticeships has had a negative impact on UK human capital formation.'[73] Such findings led, 'during the period 2005-10, [to] researchers in the group receiv[ing] an increasing number of invitations to become involved in the policy-making process.'[74] This 'close involvement with the policy community culminated in an invitation to [Professor Wolf] to conduct a Review of vocational education for the coalition government. The Wolf Review recommendations, including a comprehensive restructuring of funding and accountability mechanisms and programme content, have been accepted in full, and Wolf is actively involved in their implementation … In addition to the major impact of the Review, the group's research continues to have an impact in and beyond the government departments directly responsible for education and training (DfE and BIS).'[75]

Institutions: King's College London
Notable Funders: ESRC; Centre for the Economics of Education (DfES); Department of Health; Gatsby Foundation
Lead researchers: Professor Alison Wolf; Professor Howard Gospel
Case Study Source: https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=41239

14. Estimating the Wider Economic Impacts of Transport Investments

IS area: Infrastructure
Impact focus: Productivity, Growth
Social Science: Economics (Applied Economics, Econometrics)

Research led by Professor Graham at Imperial College London 'developed a robust modelling framework' to better estimate and assess 'the Wider Economic Impacts (WEIs) of transport investments' on local and national economies.[76] Traditional Cost Benefit Analysis (CBA) of transport investments looked 'almost exclusively [at] travel time savings' for users. Graham's statistical modelling of WEIs goes far beyond this, and 'between 2005 and 2013 [he] developed a series of models to provide empirical evidence on the impact of changes in [transport] accessibility on economic productivity and growth.'[77] This approach 'allowed … evidence to be incorporated directly within an extended CBA to capture a wider range of benefits' to investment than had traditionally been possible.[78] Graham's WEI models 'instigated an important reform of the UK approach to Cost Benefit Analysis (CBA) and provided key empirical evidence that has been formally incorporated in the UK Department for Transport (DfT) web based CBA guidance (WebTAG) since 2009. … Since 2007 Imperial staff and their industrial collaborators have applied the approach to approximately $150 Billion US Dollars of international transport investment, and its use and impact are now widespread globally. It is now a standard textbook approach for assessing the WEIs of transport investment', and the approach was included in the UK's 'official economic evaluations of CrossRail … and High Speed 2'.[79]

Institutions: Imperial College London
Notable Funders: ESRC, DfT, TfL, New Zealand Transport Authority, US DoT, High Speed 2
Lead researchers: Professor Dan Graham
Case Study Source: https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=42180

15. Mapping UK's Internet Inequality

IS area: Infrastructure, Places
Impact focus: Tackling Regional Disparities, Broadband (Digital Engagement)
Social Science: Sociology

Research led by Dr Grant Blank at the Oxford Internet Institute sought to address the lack knowledge about the geographic dispersion of digital engagement in the UK at the local and regional level. The Institute's research 'involved surveying a random sample of 2,000 people of varying ages from across the UK to determine their internet use,' creating a 'dataset [that] provides a detailed source of information about people's internet activity, behaviour and attitudes' which when combined 'with local demographic information from Census 2011 data' allowed researchers 'to estimate and map internet use across Britain … at local, regional and national levels.'[80] The database found 'important implications for policymakers' – including a 'digital divide' in digital engagement across the UK – while also providing policymakers with a tool to better identify those areas that 'would benefit most from policy intervention to improve [internet] access and encourage use.'[81] As a result, the research has been used by Ofcom, the UK Government's Digital Engagement group, and the Department for Communities and Local Government to support policy, regulation, and delivery.

Institutions: Oxford Internet Institute, University of Oxford
Notable Funders: ESRC
Lead researchers: Dr Grant Bank
Case Study Source: https://esrc.ukri.org/news-events-and-publications/impact-case-studies/mapping-uk-s-internet-inequality/

16. Making Electric Vehicles Viable for Daily Use

IS area: Infrastructure, Future of Mobility
Impact focus: Transport, Electric Vehicles
Social Science: Psychology and Economics

Research led by Professor Harris out of Oxford Brookes University sought to understand and clarify the expectations and experiences of private and corporate drivers with electric vehicles (EV), with the intent of 'inform[ing] the UK Government's strategy for ultra-low emission vehicles … to have a UK car fleet with zero emissions by 2050.'[82] Initial research, commissioned by BMW, involved 'design[ing] data collection methods and analys[ing] drivers' expectations and experiences in the UK' as part of its MINI E international trial, which showed 'consistency across nation[al experiences] and revealed that EVs are viable for everyday life with the majority of barriers relating to psychological factors rather than practical ones.'[83] The success of this research led to a grant by the UK government's Technology Strategy Board (TSB) to undertake similar work as part of their Ultra-Low Carbon Vehicle (ULCV) Demonstrator Trial from 2010 to 2012, which 'was the world's largest multi-manufacturer, multi-location trial [specifically] constructed to aid the UK Government in the design of their ultra-low emission vehicle strategy.'[84] The findings of this 'social-psychological research [programme] into drivers' use of EVs' were confirmed across nations and manufacturers, offering 'a firm foundation for government policy makers, car manufacturers, and energy suppliers seeking to convert EVs from promising prototypes to viable fully market-ready products' – and they have had an impact on the strategies of policymakers, car manufacturers and energy suppliers alike.[85] Specifically, their 'research has shown the UK Government that EVs are a viable proposition for daily use by private and corporate drivers in the UK today, and have indicated ways in which usability could be improved further.'[86] For example, 'the Head of Low Carbon Regulation, R&D and Procurement at OLEV said that "the finding that drivers used their at-home charge points for 97% of their charging time" led to the OLEV strategy to commit to providing "a national package of up to £37 million through to May 2015 to support the installation of charge-points in homes, residential streets, railway station and public sector car parks and rapid charge-points to facilitate longer journeys".'[87]

Institutions: Oxford Brookes University
Notable Funders: BMW, UK Government's Technology Strategy Board (TSB)
Lead researchers: Professor Margaret Harris
Case Study Source: https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=17132

17. Helping SMEs by Understanding how Business Knowledge is Acquired and Shared

IS area: People, Business Environment
Impact focus: Skills, Productivity, SMEs
Social Science: Business & Management Studies

Research led by Professor Richard Thorpe at Leeds University Business School (LUBS) looked at how best to deliver business education and leadership programmes to small businesses. ESRC-funded research into the Evolution of Business Knowledge (EBK), or 'how businesses acquire knowledge,' began in 2003, as it had become clear that 'business owner-managers did not value traditional approaches to learning, such as taught management programmes.'[88] Thorpe's research 'found that knowledge can be implicitly transferred through various mechanisms, including business networks, supply chains and professional advisors, and embedded in work practices and systems,' and that managers can learn in non-traditional ways, 'particularly through methods of peer learning and an action focus.'[89] As a result, the Northern Leadership Academy was formed by Leeds University Business School, Lancaster Management School and University of Liverpool Management School with support from the three Northern UK regional development agencies in 2006 to, among other goals, 'set up regional centres for delivering leadership courses and action learning sets for SMEs, peer mentoring and coaching schemes, [and] masterclasses.'[90] By 2010, the focus of the research programme moved to understanding 'how management educators, in particular business schools, could contribute to national economic growth through business support and other linkages with SMEs', as it had become 'clear that the SME sector was where there was [the] greatest need and scope for development' of leadership skills.[91] That same year, Goldman Sachs, who were impressed with the EBK model and its fresh approach, asked LUBS to deliver its first leadership course for small businesses. 'The Goldman Sachs 10,000 Small Businesses Programme … provided high-quality, practical support to the leaders of established enterprises. Seven cohorts (164 businesses) had completed the programme by July 2013.'[92] This program was then rolled out nationally in 2011/12 to Birmingham, Manchester, and London, with LUBS support and that of the universities of Aston, Manchester Metropoliton, and UCL.[93] The evaluation of the programme 'indicate[s] that as well as expressing greater confidence in growing their businesses, SME owner-managers on the programme have average net employment growth of +23% in their businesses (compared to -1% for UK Small Businesses) and an average revenue growth of +16% (compared to -9% for UK Small Businesses).'[94] The success of such programmes like this, and the LEAD programmed discussed above, contributed to the Chancellor's announcement in the Autumn 2019 Budget that it would be investing government resources to 'create a Small Business Leadership Programme, delivered in partnership with business schools and leading businesses across England… with an ambition to train 10,000 people per year by 2025.[95]

Institutions: University of Leeds
Notable Funders: ESRC, Northwest Regional Development Agency, One NorthEast, Yorkshire Forward, Goldman Sachs
Lead researchers: Professor Richard Thorpe
Case Study Source: https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=6358

18. AI and Ethics: the Ada Lovelace Institute

IS area: AI & Big Data
Impact focus: AI and Ethics
Social Science: Multidisciplinary (psychology and philosophy to sociology and statistics)

The Ada Lovelace Institute was founded by the Nuffield Foundation in 2018 with a commitment of £5 million, 'and with the support of founding partners: The Alan Turing Institute, the Royal Society, the British Academy, the Royal Statistical Society, Wellcome Trust, Luminate, techUK and the Nuffield Council on Bioethics.'[96] The primary purpose of the Institute is to 'promote informed public understanding of the impact of AI and data-driven technologies on different groups in society … [and to] guide ethical practice in the development and deployment of these technologies, [while undertaking] research and long-term thinking to lay the foundations for a data-driven society with well-being at its core.'[97] The work of the Institute is also supported by the Ethical and Societal Implications of Algorithms, Data, and AI programme at the Leverhulme Centre for the Future of Intelligence, which was 'commissioned by the Nuffield Foundation to inform the strategy of the … Ada Lovelace Institute, assess[ing] the key strengths and limitations of existing work on the ethics of AI, and identifies priorities for future research.'[98] Though the Institute's research programme is just getting underway, the importance of such interdisciplinary and collaborative work cannot be understated, as 'engaging with these challenges requires drawing on expertise not just from the sciences, but also from the arts, humanities and social sciences, and requires delving deeply into questions of policy and governance for AI.'[99] The importance of such work is also being increasingly recognised by government as well, as demonstrated by the March 2019 announcement by the UK's Committee on Standards in Public Life of a review into artificial intelligence and its impact on standards across the public sector.[100]

Institutions: The Ada Lovelace Institute
Notable Funders: Nuffield Foundation
Lead researchers: Sir Alan Wilson
Case Study Source: http://www.nuffieldfoundation.org/ada-lovelace-institute

19. Clear About Carbon: Sustainable Procurement in the Public and Private Sector

IS area: Clean Growth
Impact focus: Lowering Carbon Emissions
Social Science: Business & Management Studies, Psychology

In light of UK government policy to achieve an 80% reduction in carbon emissions by 2050, Professor Pye led the interdisciplinary *Clear About Carbon* (CAC) research project at the University of Exeter Business School (UoEBS) to help reach this goal. Aimed at developing 'leadership and management skills …to reduce carbon in organizational procurement and supply chains', the research team worked with local organisations in Cornwall to 'create new management and leadership models that could [then] be replicated nationally.' Using action learning methods, the research team conducted six monthly workshops with 47 procurement specialists and managers from 17 different local organisations, including as the NHS Peninsula Purchasing & Supply Alliance (PPSA) and the Devon & Cornwall Constabulary. Through this they were able to 'embe[d] low carbon practice into the procurement policies and supply chains of [these] private and public sector organisations' in Cornwall.[101] The Devon & Cornwall Police, for example, were soon thereafter named the 'Most Sustainable Public Sector Organisation in Emergency Services', and the PPSA (with the help of the research team) were able to 'develo[p] a Benefits Tracker Tool that compares cash savings, carbon savings and time savings for public contracts' which has been used 'since April 2012…to calculate financial and carbon savings in all PPSA procurement contracts.'[102] In addition to helping 'Cornish SMEs to respond to the low carbon agenda,' the research has also 'contributed to sustainability initiatives led by the Department of Health and Defra, and boosted economic competitiveness of participating organisations.'[103]

Institutions: University of Exeter Business School
Notable Funders: European Social Fund (ESF)
Lead researchers: Professor Annie Pye
Case Study Source: https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=38969

20. Energy Consumption and Behaviour Change

IS area: Clean Growth
Impact focus: Energy consumption
Social Science: Sociology

'Effective responses to climate change need substantial reductions in energy consumption. New, more efficient, technologies and less polluting forms of supply are part of the story, but the bottom line is that ways of life will also have to change. So, governments spend substantial sums persuading individuals to do their bit, to kick the CO2 habit and act responsibly. An estimate from the National Audit Office says such initiatives cost £284 million a year for the UK and yet energy demand has fallen hardly at all. Professor Elizabeth Shove of Lancaster University decided to investigate why. Interviews with more than 100 households, policy-actors and manufacturers, plus historical studies of bathing, laundering, heating and cooling indicate that practices like those of taking a daily shower or of maintaining 22°C indoors whatever the weather cannot be explained solely in terms of personal preference or individual choice. Rather, successful energy-consumption reduction is a matter of understanding how patterns of daily life evolve along with ordinary technologies and infrastructures like bathrooms, kitchens, and washing machines. Research in this tradition has been influential in showing that individual persuasion as a policy strategy has significant limits and in showing the many other ways in which governments and businesses shape what people take to be normal ways of life. These insights have been taken up both within the UK – by the Royal Commission on Environmental Pollution, by the WWF and by the National Audit Office – and internationally by the UN Environment Programme and the World Business Council for Sustainable Development.'[104]

Institutions: Lancaster University
Notable Funders: ESRC
Lead researchers: Professor Elizabeth Shove
Case Study Source: https://campaignforsocialscience.org.uk/wp-content/uploads/2012/12/Making-the-Case-Climate-Change.pdf

21. Greening the Supply Chain Efficiently

IS area: Clean Growth
Impact focus: Carbon Emission Reduction
Social Science: Business and Management Studies

Research led by Professor Koh at the Sheffield University Management School (SUMS) looked at how businesses could reduce their carbon footprint through better management of their resource supply chains. 'Between 2005 and 2010, … the group undertook new research on green supply chain theory through the study of supply chains in Europe and Asia.'[105] Koh's team advocated 'a balanced whole supply chain system approach' and eventually focused their research on identifying the 'causality between … system interventions and supply chain practices to evaluate and optimise the effectiveness of the tools that the team might develop.' [106] Koh's team then put their theory into practice, developing the Supply Chain Environment Analysis Tool (SCEnAT) to help businesses make environmentally friendly and efficient supply chain decisions by helping them to 'identify areas of high carbon usage and select lowest-cost interventions to address them.'[107] SCEnAT 'has helped businesses change their operations to reduce CO2 emissions, make cost savings of up to £250k per company and [to] improve their business performance through, in one case, winning additional contracts worth £1.75m. … The research has also been used by regional business organisations in developing and implementing growth strategies to support low carbon businesses in Yorkshire and Humber.'[108] This research programme has thus had both an 'economic and environmental impact, helping businesses adapt operations to achieve carbon-reduction targets, whilst reducing costs.'[109]

Institutions: Sheffield University Management School
Notable Funders: European Union; European Regional Development Fund
Lead researchers: Professor Lenny Koh
Case Study Source: https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=22920

22. New Sustainable Business Model for Low-volume Car Manufacturing

IS area: Ideas, Future of Mobility
Impact focus: Innovation, Sustainable Car Production
Social Science: Business & Management Studies

This body of research aimed to improve understanding of the economies of scale in the automotive industry, first by tracing the historical development of mass car production and then through an examination of the profitability and feasibility of low-volume car production. 'Building on this knowledge, a new business model for more sustainable low-volume car making, Micro Factory Retailing (MFR), was developed' by Nieuwenhuis and Wells.[110] Their research demonstrates how this 'integrated business model, combining assembly – based on … modular car concepts – with retail, service, repair and upgrading, can enhance customer-focus and market responsiveness.'[111] It can also improve business sustainability, by lowering costs for the overall business and eliminating over-production and waste. This new business model 'has benefited a number of low volume UK car makers [including] Morgan, Gordon Murray, and Axon – as well as … Local Motors in the US.'[112]

Institutions: Cardiff University Business School
Notable Funders: ESRC Centre for Business Relationships, Accountability, Sustainability and Society (BRASS)
Lead researchers: Paul Nieuwenhuis and Peter Wells
Case Study Source: https://charteredabs.org/publications/cardiff-university-business-school-impact-case-study/

23. Reconfiguring policy scenarios in transport

IS area: Clean Growth, Infrastructure
Impact focus: Carbon Emission Reduction
Social Science: Geography, Urban and Regional Planning, Economics

Research led by Professor Banister and Dr Hickman at the Transport Studies Unit (TSU) in the University of Oxford has helped cities and local and regional governments in the UK and abroad 'to adjust their transport policies over the longer term (to 2050) towards low carbon alternatives.'[113] Banister and Hickman developed an approach for developing transport policies called 'backcasting', which has changed the way many decisionmakers now think about the process. This 'approach establishes a quantitative baseline for the future (to 2030 or 2050), together with a set of interim targets that would need to be achieved at intervening dates, in order to reduce the transport impact on CO2 emissions, on energy consumption, on environmental factors (safety), on accessibility, on growth, and on other economic factors.'[114] This allows policymakers to identify different pathways, and the policy actions necessary to underpin them, if their envisioned goals are to be met. This process, the *Visioning and Backcasting of Transport* (VIBAT, www.vibat.org), has been used by local and national authorities in the UK (for example by Oxfordshire County Council, DfT, and TfL), Canada, India, New Zealand, China, and Japan.[115]

Institutions: University of Oxford
Notable Funders: Department for Transport, EU, Transport for London, Asian Development Bank
Lead researchers: Professor Banister, Dr Hickman
Case Study Source: https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=16772

Concluding Thoughts

The Government's Industrial Strategy (IS) aims to improve and prepare the UK economy for the future by maintaining high levels of employment while raising productivity.[116] The IS specifically recognises that ideas, people, infrastructure, business environment, and 'place' are foundational to improving productivity across the UK. As part of the IS, the government has also promised to raise the national target for research and development investment and has created the Investment Fund (IF), the National Productivity Investment Fund (NPIF), the Industrial Strategy Challenge Fund (ISCF), and the Strength in Places Fund (SIPF). The Academy of Social Science applauds all these aims and welcomes the increased focus that the creation of UKRI has brought to bear on them. We also warmly welcome the recognition of productivity research as a strategic priority of the ESRC, and its commitment to 'developing an ambitious, innovative, and impactful research agenda to fund productivity-related research over 2018-2023.'[117]

The social sciences are vital to achieving many of the aims of the industrial strategy. This paper began by setting out how the Industrial Strategy White Paper itself was shaped by social science. Good social science has clearly helped to shape, define and diagnose the issues underpinning the IS and our understanding of what the country needs to do to grow and improve the economy. This paper then presented some of the strongest case studies the Campaign for Social Science has gathered from its member Learned Societies and Fellows, showing the various ways that social scientists have contributed to current thinking on the industrial strategy through not only their descriptive or diagnostic work, but also through cutting-edge social science-led interventions that have helped drive change. Many of these case studies show social science researchers at universities working hand in hand with their local regions or with local businesses, underlining importance of both social science and universities as drivers of local growth and dissemination of changing practices.

Social science, quite simply, is needed to unlock all elements of the UK's productivity puzzle. The cases in this paper show how good social science can help to identify the innovations that can help improve leadership skills and the business environment for SMEs. They show how good social science can improve the decisions made by companies and policymakers on issues ranging from infrastructure development to where to locate their businesses and how to better integrate them into their local economies. They also show how good social science can help bring STEM innovations to market, and to change behaviour and decision making to incentivise clean growth. Many of them also demonstrate how good social science can contribute to regional growth and development, both through its research and the civic universities that host that research and anchor it to its surrounding environment. These are but a few examples of a national research program that is flourishing and which provides a large amount of return to what have thus far been modest investments.

These exemplary case studies show what the social sciences can do, when given the opportunity. Thus far, however, the investment focus of the government has largely been on STEM research and solutions to highly specific problems. The grants awarded through the ISCF and the SIPF, for example, have been heavily weighted towards STEM projects, with little input sought from the social sciences on how to

ensure those solutions can be adapted to broader markets or their lessons integrated into other locations and context.

We welcome the recognition of productivity as one of the strategic priorities of the ESRC for the 2018-2023 period but, even with this investment, relatively small sums of money are available for strategic social science research related to Industrial Strategy options in general.

But there are many other issues that need social science leadership, if the government truly wishes to see the delivery of prosperity across all regions. For example, both long- and short-term investment is needed into understanding the pre-requisite social conditions needed to make large scale productivity change possible in the first place. Improvements to the human capital of our nation, for the good of both its people and its output, require research into the delivery of skills ranging from the vocational to managerial. Social science-led research is needed achieve the individual and organisational behavioural shifts required to ensure the adoption of low-carbon alternatives and other STEM innovations. Business schools, for example, can help ensure that such research is delivered in a way that benefits their regions, because of their existing relationships with local enterprise and industry. And if artificial intelligence and big data are to be harnessed in a way that benefits, rather than damages, our society, we need social science to lead the discussion around how it is used and implemented in areas ranging from national defence to our everyday lives.

For these reasons, we hope this paper will stimulate wider conversation about what sorts of work social science might do for UK plc in future. We know there are various initiatives underway, for instance, to look at challenges and changes with the ESRC about the social science contribution, and we await news of these. But we hope these case studies of recent research help demonstrate that the social sciences have a vital contribution to make.

Notes

[1] *Industrial Strategy: Building a Britain fit for the future*. Presented to Parliament by the Secretary of State for Business, Energy and Industrial Strategy by Command of Her Majesty (November 2017), p. 6. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/730043/industrial-strategy-white-paper-print-ready-a4-version.pdf.

[2] *Industrial Strategy: Building a Britain fit for the future*. November 2017, p. 10-11.

[3] *Industrial Strategy: Building a Britain fit for the future*. November 2017, p. 11.

[4] *Industrial Strategy: Building a Britain fit for the future*. November 2017, p. 7.

[5]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/571556/autumn_statement_2016_print.pdf.

[6] https://www.gov.uk/government/news/record-boost-to-rd-and-new-transport-fund-to-help-build-economy-fit-for-the-future.

[7] See, e.g. – https://www.ukri.org/innovation/industrial-strategy-challenge-fund/ and https://www.gov.uk/government/collections/industrial-strategy-challenge-fund-joint-research-and-innovation.

[8] https://www.gov.uk/government/news/industrial-strategy-challenge-fund-tell-us-what-to-support.

[9] These challenges are: 'Audience of the future; Faraday battery challenge, From data to early diagnosis and precision medicine; Healthy ageing; Leading-edge healthcare; Next-generation services; Prospering from the energy revolution; Quantum technologies; Robots for a safer world; Transforming construction; Transforming food production; Creative industries clusters; Driverless cars; Manufacturing and future materials; National Satellite Test Facility.' https://www.gov.uk/government/collections/industrial-strategy-challenge-fund-joint-research-and-innovation.

[10] It should be noted that many of these not only carry out published research, but also provide consultancy direct to business and government.

[11] https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=28995.

[12] https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=28995.

[13] https://ec.europa.eu/info/designing-next-framework-programme/mission-oriented-policy-next-research-and-innovation-framework-programme_en.

[14] Industrial Strategy: Building a Britain fit for the future. Presented to Parliament by the Secretary of State for Business, Energy and Industrial Strategy by Command of Her Majesty (November 2017), p. 35 (emphasis added).

[15] http://cep.lse.ac.uk/management/Management_Practice_and_Productivity.pdf.

[16] The UK's Productivity Problem: Hub No Spokes - speech by Andy Haldane Given at the Academy of Social Sciences Annual Lecture, London (28 June 2018). https://www.bankofengland.co.uk/speech/2018/andy-haldane-academy-of-social-sciences-annual-lecture-2018.

[17] https://www.acss.org.uk/wp-content/uploads/2013/11/mtc6_management.pdf.

[18] Industrial Strategy: Building a Britain fit for the future. Presented to Parliament by the Secretary of State for Business, Energy and Industrial Strategy by Command of Her Majesty (November 2017), p. 169. Please note, the work referenced in the Industrial strategy is: Centre for Economic Performance (2007) 'Management Practice & Productivity: Why they matter' http://cep.lse.ac.uk/management/Management_Practice_and_Productivity.pdf and Bloom, Van Reenen (2016), 'Measuring and explaining management practices across firms and countries', http://www.nber.org/papers/w12216.

[19] Industrial Strategy: Building a Britain fit for the future. Presented to Parliament by the Secretary of State for Business, Energy and Industrial Strategy by Command of Her Majesty (November 2017), p. 216. Please note, the work referenced in the Industrial strategy on pages 216-17 is: Martin et al. (2015), 'Spatially rebalancing the UK economy: The need for a new policy model', http://www.regionalstudies.org/uploads/documents/SRTUKE_v16_PRINT.pdf.

[20] https://www.mdx.ac.uk/__data/assets/pdf_file/0021/145038/Local_economic_policy_and_deprived_areas.pdf.

[21] https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=39883.

[22] https://esrc.ukri.org/news-events-and-publications/evidence-briefings/increasing-uk-productivity-through-city-support/.

[23] https://esrc.ukri.org/news-events-and-publications/evidence-briefings/increasing-uk-productivity-through-city-support/.

[24] https://www.gov.uk/guidance/what-works-network.

[25] https://esrc.ukri.org/news-events-and-publications/evidence-briefings/finding-effective-innovation-policies-for-local-growth/.

[26] https://esrc.ukri.org/news-events-and-publications/evidence-briefings/finding-effective-innovation-policies-for-local-growth/.

[27] https://esrc.ukri.org/news-events-and-publications/evidence-briefings/finding-effective-innovation-policies-for-local-growth/.

[28] https://esrc.ukri.org/news-events-and-publications/evidence-briefings/finding-effective-innovation-policies-for-local-growth/.

[29] https://whatworksgrowth.org/policy-reviews/innovation/.

[30] https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=16712.

[31] https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=16712.

[32] https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=16712.

[33] http://impact.ref.ac.uk/CaseStudies/CaseStudy.aspx?Id=16712.

[34] https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=38968.

[35] http://impact.ref.ac.uk/CaseStudies/CaseStudy.aspx?Id=38968.

[36] https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=38968.

[37] http://impact.ref.ac.uk/CaseStudies/CaseStudy.aspx?Id=38968.

[38] https://charteredabs.org/publications/revealing-the-factors-which-drive-innovation-growth-and-productivity-in-small-and-medium-sized-enterprises-smes/.

[39] https://charteredabs.org/publications/revealing-the-factors-which-drive-innovation-growth-and-productivity-in-small-and-medium-sized-enterprises-smes/.

[40] https://charteredabs.org/publications/revealing-the-factors-which-drive-innovation-growth-and-productivity-in-small-and-medium-sized-enterprises-smes/.

[41] https://charteredabs.org/publications/revealing-the-factors-which-drive-innovation-growth-and-productivity-in-small-and-medium-sized-enterprises-smes/.

[42] http://impact.ref.ac.uk/CaseStudies/CaseStudy.aspx?Id=6354.

[43] http://impact.ref.ac.uk/CaseStudies/CaseStudy.aspx?Id=6354.

[44] http://impact.ref.ac.uk/CaseStudies/CaseStudy.aspx?Id=6354.

[45] http://impact.ref.ac.uk/CaseStudies/CaseStudy.aspx?Id=6354.

[46] http://impact.ref.ac.uk/CaseStudies/CaseStudy.aspx?Id=6354.

[47] https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=34498.

[48] https://impact.ref.ac.uk/casestudies/CaseStudy.aspx?Id=34498.

[49] http://impact.ref.ac.uk/CaseStudies/CaseStudy.aspx?Id=43594.

[50] http://impact.ref.ac.uk/CaseStudies/CaseStudy.aspx?Id=43594.

[51] http://impact.ref.ac.uk/CaseStudies/CaseStudy.aspx?Id=43594.

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