

Knowledge Economy Strategy 2020

The Work Foundation submission to the Comprehensive Spending Review

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Contents

1.	Introduction	4
2.	The knowledge economy and the economic challenges	5
3.	Cross-cutting priorities	8
4.	Towards a Comprehensive Innovation Review	11
5.	Skills and the knowledge economy	17
6.	Knowledge economy industrial strategy	22
7.	The geography of the knowledge economy – redefining urban policy	26
8.	Conclusions and recommendations	29
9.	Contact details	31

Executive summary

In this submission we have identified some of the key priorities we think should inform the outcome of the Comprehensive Spending Review. These are summarised below:

- **The government must make a long term commitment to support the following areas of the Knowledge Economy:**
 - Science, technology, R&D, design and creative sector support budgets
 - Higher education
 - Public investment in the physical, energy and digital infrastructures
- **There should be a Comprehensive Innovation Review to match the Comprehensive Spending Review to build a UK innovation system over the next ten years. This would include:**
 - Strengthen technology transfer from universities to market by creating a network of fewer, more focused, and better-funded intermediary institutions;
 - Complement this exercise by similar initiatives to strengthen the UK's capabilities in areas such as design and across the creative industries;
 - Build a financial and skills system that offers more support for innovation and entrepreneurship.
- **The higher and further education system must continue to expand capacity to meet the continued rising demand for higher knowledge intensive skills.**
 - The expansion of higher education without sacrificing quality must come from a greater private sector contribution, primarily higher student fees accompanied by a reform of the student loan system and greater freedom for universities in setting fees;
 - Science, Technology, Engineering and Mathematics (STEM) skills remain a high priority, with a strong focus that graduate output fully meets the needs of modern industry and the innovation system;
 - There should be a less restrictive migration policy for high level skills, encouraging overseas students and giving global companies flexibility in meeting their high level skill needs;
- **Industrial strategy for the knowledge economy should focus on four key growth sectors: advanced manufacturing, the creative and cultural sectors, high tech services, and low carbon economy. Specific actions are required to support R&D, high growth firms, and the low carbon economy**
- **Urban policy should be knowledge economy focused, including support for local high growth firms, improved access to capital and skills, making the most of the public sector as a source of innovation, and building links between more and less successful cities.**

Section 1

Introduction

The Coalition faces three immense and closely related economic and social tasks – sustainable deficit reduction, putting in place the conditions for a strong private sector led recovery, and ensuring all parts of the country benefit from new sources of jobs and growth. Our central argument is that a knowledge economy based growth strategy is the best way of reconciling these objectives.

The Work Foundation has long argued for the adoption of an explicit knowledge economy based strategy, drawing extensively on the work of its Knowledge Economy Programme. The need for such a strategy is even more important if the economy is to successfully navigate the current crisis. We are experiencing the combination of a once in a century economic shock and an acceleration in long run global structural changes. The UK is at the centre of this convergence.

In April 2010 we launched our pre-Election statement, *Innovation, Creativity and Entrepreneurship in 2020*¹. We argued that after a decade of excessive dependence on a property boom, easy credit, the City and the public sector, the economy would have to create a national innovation eco-system to support new industries, new activities, and new sources of enterprise and jobs. We set out how the various elements of an innovation eco-system could be developed over the next decade. We identified four growth areas that should be prioritised:

- advanced manufacturing
- high tech services
- creative and cultural industries
- low carbon activities

The Prime Minister has already clearly stated the Coalition's commitment to a more balanced economy.:

*"Today, our economy is heavily reliant on just a few industries and a few regions – particularly London and the South East. This really matters. An economy with such a narrow foundation is fundamentally unstable and wasteful. We are determined that should change. That doesn't mean picking winners but it does mean supporting growth industries – aerospace, pharmaceuticals, high value manufacturing, high tech engineering, low carbon technology. And all the knowledge based businesses including the creative industries"*².

The Spending Review Framework published in June 2010 committed the government to four strategic priorities. Three of the priorities centre on cutting out waste, changing the way services are delivered, and reform to the welfare system and public sector pay and pensions. These are all important issues, but essentially revolve around cutting public spending. However, the Review's fourth commitment is just as critical. The Coalition is committed: *"to look beyond near-term pressures to support reforms that better position the UK for meeting long term demographic, economic, environmental, and social challenges, any of which could imperil long term fiscal stability if left unaddressed."* These reforms are central to delivering the Prime Minister's ambition to rebalance the economy and the Coalition's strategy for growth.

We have urged the Coalition to give much more attention to where the new sources of growth and jobs are to be found and make that a guiding principle in prioritising government decisions. This

¹ Brinkley (2010) *Innovation, Creativity and Entrepreneurship in 2020*, The Work Foundation Statement.

² *Transforming the British economy: Coalition strategy for Growth*, May 28 2010.

Knowledge Economy Strategy 2020

The Work Foundation submission to the Comprehensive Spending Review

goes far beyond the conventional focus just on public spending, but also the frameworks and regulatory environment that can have an equally important impact on longer term growth prospects. We also highlighted the severe underlying regional imbalances, with a very high dependence on the public sector for job creation in many regions outside the greater south east³. In a further analysis, we showed that a combination of such dependence and a weak private sector knowledge economy was at the heart of even greater divergence within regions at the local city level⁴.

The government's ambition to resolve the public structural deficit challenge within one Parliament cannot be realised through fiscal measures alone. There also needs to be a strong recovery in growth, investment and jobs. The Review needs to articulate clearly and prominently how the decisions made will help achieve these objectives, otherwise it risks as being seen as about nothing but cutting public services.

The Framework also set out a number of criteria against which government spending decisions would be assessed. These questions inform our recommendations. They include whether the activity is essential to meet government priorities; does the government need to fund the activity; does the activity provide substantive economic value; can the activity be promoted at low cost and more effectively; and can local bodies provide the activity rather than central government.

The Framework also said the government will consider whether some funding commitments should be made beyond the lifetime of one Parliament to give greater certainty to providers, users, and investors. This is a very important criterion. Ring-fencing of certain areas of expenditure before such a fundamental spending review was not an ideal approach. But as an outcome of the review, it is essential that the Coalition commits itself to sustaining priority areas of spending over the next decade. Many critical areas such as education and science, technology, and design do not offer quick returns and require long term funding. Business requires a clear signal from government of long term commitment in areas where the risk is too high for business alone to make the necessary investments – for example, areas such as power generation and the low carbon economy.

The knowledge economy and the economic challenges

The UK is part of an OECD wide transformation in industrial and occupational structure towards knowledge intensive industries and knowledge intensive jobs. Across the OECD, the number of people working in knowledge intensive and technologically advanced industries grew from 50 million to 150 million between 1970 and 2005.

In the UK, employment in knowledge intensive market based services (information and communication; professional, scientific and technical services; financial and real estate; admin and support activities; and arts, entertainment and recreational services) went up by 93 per cent between 1979 and 2010, while employment in more public based services such as education and healthcare increased by 89 per cent. In contrast, employment across the economy as a whole went up by 13 per cent.

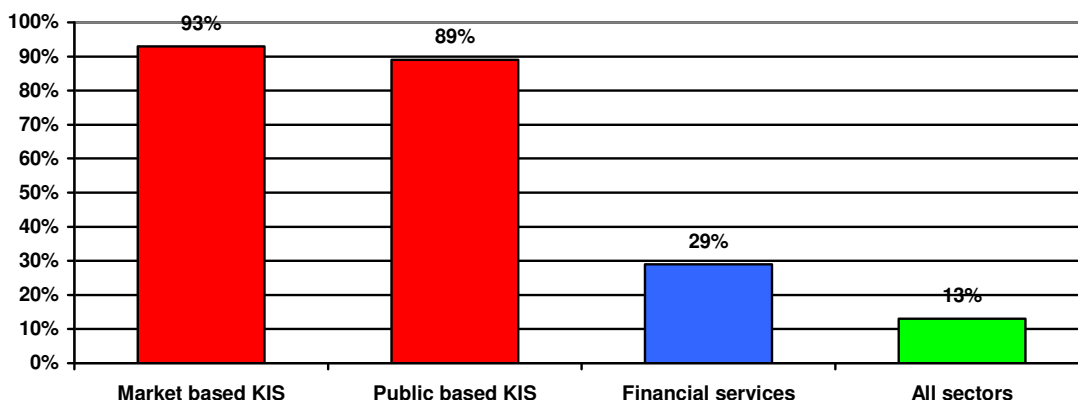
This is shown in the following chart. The chart also shows the contribution to jobs from financial services. Although the increase is significant over the period – up 29 per cent – this is a story of the 1980s following partial deregulation. Between 1990 and 2010 employment in financial services fell by 10 per cent. Despite the attention given to the sector, it has not been a net generator of jobs over the past twenty years. Non-financial knowledge intensive services have been the big job generators.

³ Brinkley et al (2010) *Cut, Tax, Grow?* The Work Foundation 2010.

⁴ Lee (2010) *No City Left Behind*, The Work Foundation Cities 2020 Programme.

Knowledge services provide most new jobs 1979-2010

Note: all figures UK, workforce jobs



Market based Knowledge Intensive Services (KIS) are information and communication; professional, scientific and technical; financial and real estate; admin and support activities; financial and real estate; and arts, entertainment and recreation (SICs J to N + R).
 Public based Knowledge Intensive Services (KIS) are education and healthcare (SICs P-Q).
 Based on OECD/Eurostat definitions, updated to Standard Industrial Classification 2007.

These trends have been driven by three massive changes in the way economies work and how organisations within them operate:

- The rise of knowledge and technology intensive jobs and economic activity;
- Investment in knowledge based assets or “intangibles”;
- Increasing well qualified and educated workforces.

The primary driver is rising demand for high value added services and goods from wealthier, more sophisticated, diverse, and demanding consumers. The great enablers are powerful and cheap computers and the “general purpose” information and communication technologies coupled with mass higher education. The accelerator on both the demand and supply side has been globalisation, creating markets of scale and also diversity and facilitating the flow of ideas, concepts, technologies, capital and people.

The recovery in employment will be led by the knowledge intensive industries⁵. This was true in the last two recessions in the UK, across the EU15, and in the United States⁶. The recovery from the 1990s saw strong growth in jobs in private based knowledge based services and a strong export

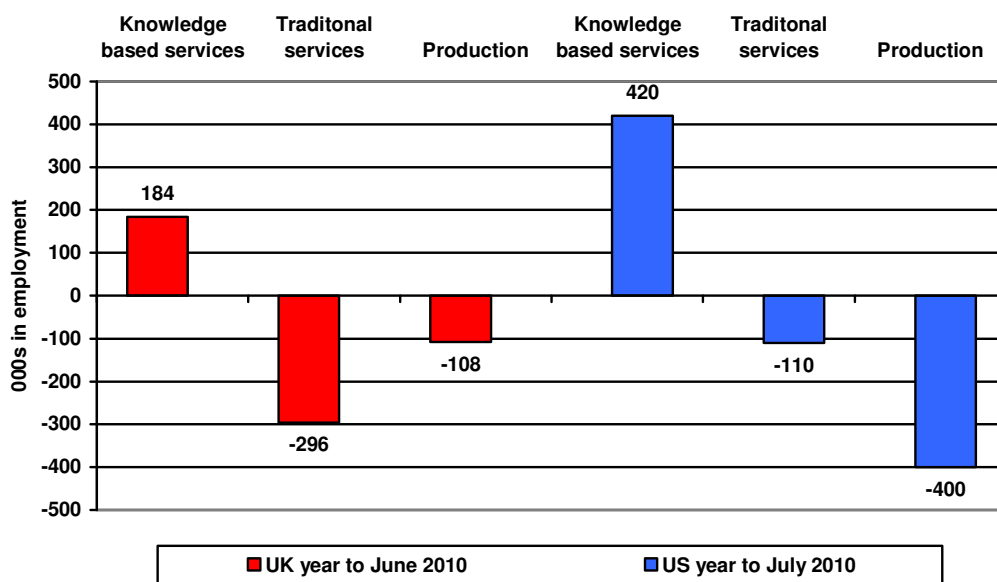
⁵ OECD/Eurostat definition includes high tech manufacturing, high tech, business, telecommunication, and financial services, and education and healthcare services. We also include the cultural and creative industries. Under the latest industrial classification (SIC 2007) knowledge intensive services include the information and communication, financial services, real estate, arts, recreation and entertainment, business support services, and professional, scientific, and technical services.

⁶ Brinkley (2009) *Recovery and recession*, The Work Foundation.

driven performance from manufacturing. The knowledge based sectors led the recoveries following the 1980s and 1990s recessions. Between 1991 and 1998 private sector based knowledge services produced nearly 1 million new employee jobs, with over 600,000 coming from high tech and other business services.

This is also true in this recovery. Knowledge based services have been the main source of job growth in both the UK and in the US over the past year (taking the latest month for which the figures are available)⁷. This is shown in the chart below. The story across Europe as a whole is more diverse, but overall knowledge based services are the major source of net new job growth.

Knowledge based job recovery in two economies



The economic challenges summarised in the opening paragraph of this submission requires a relentless focus on what areas of the economy can grow and create jobs. This recovery will have some important differences that will intensify reliance on expanding the private sector knowledge intensive services:

- previous recoveries also saw growing employment in education and health related services, despite these being periods of public spending austerity. We expect some growth in these areas – especially healthcare - will continue supported by rising private funded demand, but not on the scale seen in the 1990s.
- the contribution from private based traditional services will be less than in the past with more modest growth in consumption and changes in technology and markets reducing the labour intensity of some retailing.
- manufacturing will make a big contribution to the recovery with exports and technological driven innovation in both products and services and an indirect contribution to jobs in

⁷ Traditional services are transport, distribution, food and accommodation services, public administration, other services. Production is construction and manufacturing, excluding power, water, agriculture and mining. The UK figures are total employment, including the self-employed. The US figures are national definitions for the same groups of industries for employees only.

related high value added service industries. It will not however create many jobs within the manufacturing sector itself.

Cross-cutting priorities

We have argued that the development of an explicit knowledge economy strategy is an essential way in delivering the Coalition's wider economic objectives. We have identified three areas where a cross cutting and longer term approach is essential in developing such a strategy. They should also be areas where the government makes longer term commitments beyond the lifetime of the current parliament.

- (a) Science, technology, R&D, Creativity and Design:** the principle of ring-fencing *before* a far reaching and fundamental review is not a sound one, but there is a strong case for ring-fencing *after* such a review. The budgets that support science, technology, R&D, and the creative arts and design infrastructure should be ring-fenced with a commitment for at least a decade. We have deliberately included creativity and design alongside science and technology because in a knowledge based economy the two are inseparable. We should therefore be as concerned with the continued good health of the supporting institutional infrastructure for art and design as with science and technology. Many organisations in the creative industries have developed cutting edge innovation in the use of new technologies, while even the most "hard science" intensive firms bring a creativity and flair to their products and services that would be instantly recognised by "creatives".

We have previously highlighted the importance of "general purpose technologies" in our pre-Election statement as an underlying driver of growth and innovation. Those economies that have typically done well in adapting and adopting new technologies have also shown consistent commitment towards investment in these areas. According to the OECD, the success of Finland's innovation policy owes much to the long term approach which prioritised public support in these areas through periods of fiscal retrenchment⁸. This does not mean we can safely ignore the traditional indicators such as investment in R&D. We have argued that setting an unrealistic target for R&D as a share of GDP makes little sense. Instead we should look at R&D effort in particular sectors, consider how different market conditions, regulatory environment, and industry characteristics impact on R&D decisions, and identify what public policy can do to encourage higher R&D rates in the "big three" areas of R&D investment of aerospace, pharmaceuticals, and high tech services and new areas of activity such as green technologies where the Coalition has already signalled a commitment. The universal R&D tax credit may be a blunt instrument in isolation: it can only be part of the overall environment that makes global companies invest in the UK rather than somewhere else.

- (b) Higher education:** the UK has a good quality higher education system and the share of graduates in the workforce is high by international standards, even if it has not caught the world leaders such as the United States. UK business also invest large sums by international standards in human capital. We think it imperative that the UK continue to allow the higher education sector to expand. There is little convincing evidence in our view that overall the supply of graduate level skills to the economy is excessive, although there are continued concerns that the skills they have are not been used as well as they might. Moreover, as BIS has recognised, the sector has emerged as a significant economic force in its own right, both as an agent of local economic change and as an exporter of knowledge services.

⁸ OECD (2005) *Innovation Policy and Performance*

The Leitch Review concluded that taxpayers could not fund the continued expansion of higher education, but no alternative was put in place other than to encourage universities to expand non-public sources of funding. As a result, we have become trapped in a perverse and self-defeating system that artificially restricts supply by penalising universities for trying to meet that demand. The alternative of cramming bigger numbers through for the same funding can encourage universities to develop even more innovative ways to deliver courses at lower cost further, but at a high risk of undermining the quality that has made the UK higher education system a success. We think demand will continue to rise and it can only be realistically met by a more market based approach increasing the cost to some individuals and, where appropriate, some employers. Universities should have greater flexibility in setting fees. A central objective must be to ensure sufficient support for centres of excellence throughout the higher education system.

A more difficult issue is how far the government should be actively steering students towards areas such as STEM. The evidence no longer points strongly to a quantity problem, but given the persistence of employer concerns there may be a problem with particular specialist areas and more generally with quality and relevance. The UK's science base performs well, but the conversion of public investment in STEM into an expansion of the scientific research workforce is poor by international standards. In other words, the problem lies as much on the demand side as the supply side, and unless demand is raised then increasing supply will simply increase the flow of STEM graduates into non-STEM occupations.

There are three major distributional issues that the government must also simultaneously address. Firstly, if market forces are going to be given a stronger role in determining the overall supply and distribution of university courses, then a robust system to support students from poorer backgrounds must be sustained. At least some of the cash raised by higher fees should be diverted towards more generous support for the less advantaged. Secondly, although investment by firms in human capital is high, much tends to be captured by managers and professionals: the evidence suggests the UK performs much more poorly on developing skills below university degree level. Thirdly, there is a strong relationship between the levels of skills and local unemployment rates and areas where skill levels are poor will struggle to benefit from the recovery. Such areas typically have few "knowledge workers" who often attract further human capital investment or high value added, knowledge intensive firms who typically invest the most in their workforces. Looking at ways to increase both private and public investment in skills at the local level to reverse the low skill downward spiral should be a clear priority for Local Enterprise Partnerships.

- (c) **Infrastructure investment:** the June Budget confirmed that major cuts would take place in public investment in line with previous plans, with the Chancellor arguing that any additional reductions in public spending over previous plans would have to fall on current spending. This is welcome, but we would argue that the balance needs to move further back towards capital expenditure. Periods of fiscal retrenchment always fall on public investment programmes disproportionately and this is still the case in terms of the Budget plans. However, this is exactly the sort of expenditure that is easy to postpone in the short term but builds up problems in the longer run, creating backlogs in investment and repair programmes. It is also noticeable that a number of other OECD economies have taken the opportunity to increase investment in both physical and digital infrastructures to a greater extent than the UK as part of the response to the crisis. The Chancellor has made clear that extra savings made elsewhere could be channelled back towards priority areas. We think a partial replacement of capital spending projects should be one of those priorities.

The government will also want to consider what areas of capital spending should be given priority. In our view, it has to be those that directly support economic growth, industrial competitiveness, and so focusing in particular on transport and related economic and industrial regeneration schemes and support for investing in the digital and energy infrastructures. This may mean giving somewhat lower priority to other public investment areas that in a more favourable climate would have gone ahead.

Even with a refocusing of investment priorities, the demands for new infrastructure investment will far exceed any plausible level of public funding. The gap must, wherever possible, be made up by creating sufficiently attractive conditions for long term investment by the private sector. The Government has explicitly recognised the need to look at new institutions and changes in regulatory framework as part of its approach to the low carbon economy, which we discuss in more detail later in this statement⁹. This approach, while very welcome, needs to be far more ambitious. It was disappointing that the joint Treasury-BIS consultative paper *Financing a private sector recovery* did not look at ideas such as an Infrastructure Investment Bank (IIB) that have been developed by the Institute for Civil Engineering (ICE) and others to provide long term private capital for a much wider range of infrastructure investments. The scope of the Autumn Green Paper should be extended to consider the case for these bodies in more detail alongside the future of PFI and charging options (for example, toll roads).

Benchmarking the knowledge economy

A knowledge economy strategy must be grounded on how the UK compares with other major economies, identifying strengths and weaknesses and examples of success and failure from other economies. This would help identify areas where intervention is still required and the conditions required for such intervention to be a success; and also areas where government has no active role to play or where the chances of failure are excessively high.

NESTA has recently published a useful summary of how the UK innovation system currently stands compared with the rest of the OECD as part of the development of an innovation index for BIS. This shows the UK does well on competition and entrepreneurship, has a mixed performance on public research and openness to new ideas, and does less well in supporting demand for innovation, access to finance, and skills. We need to extend this concept and look at how well the UK is performing on a wider range of knowledge economy indicators both for the economy as a whole and for groups of activities.

The UK statistical authorities have already proved innovative in their approach to intangibles, but this interest needs to be consolidated and prioritised, otherwise the measures we have will soon be hopelessly out of date. Estimates of what OECD economies are investing in intangibles currently depends on a mix of academic and semi-official studies. The UK's figures are for 2004, those for the US are at least a decade out of date. The table below summarises how the UK performs in terms of intangible investment for those economies for which the estimates have been made. They all share a common methodology, but differences in the quality and comprehensiveness of the statistical information make direct comparisons problematic. Nonetheless they give some idea of how the UK ranks.

⁹ *Financing a private sector recovery*, HMT and BIS July 2010.

INVESTMENT IN INTANGIBLES – HOW THE UK COMPARES - % of GDP

Design		Brand equity		Human capital		Organisational capital	
Sweden	2.4	Finland	2.7	UK	3.1	US	3.1
Spain	1.4	Netherlands	2.2	France	2.3	France	2.8
UK	1.2	US	1.7	Canada	2.0	Australia	2.6
Italy	0.8	Sweden	1.6	Finland	1.9	UK	2.2
Germany	0.9	Australia	1.4	Germany	1.9	Finland	1.8
France	2.2	France	1.5	Italy	1.4	Netherlands	1.7
Canada	1.8	UK	1.2	US	1.4	Japan	1.6
Finland	1.8	Italy	1.2	Spain	1.2	Germany	1.4
Japan	1.8	Japan	1.0	Sweden	1.1	Canada	1.0
US	1.8	Germany	0.8	Netherlands	1.1	Spain	0.9
Australia	1.7	Spain	0.6	Australia	0.7	Sweden	0.7
Netherlands	0.6	Canada	0.5	Japan	0.4	Italy	0.6
Software		Business R&D		All intangibles			
Japan	2.2	Finland	2.8	Finland	14.6		
UK	1.9	Sweden	2.8	US	13.5		
Sweden	1.8	Japan	2.7	UK	13.0		
US	1.7	US	2.0	France	12.6		
Netherlands	1.2	Germany	1.8	Sweden	10.9		
Canada	1.0	France	1.3	Japan	10.5		
Finland	1.0	Australia	1.2	Germany	10.1		
France	0.9	UK	1.1	Australia	9.6		
Australia	0.8	Canada	1.0	Netherlands	9.3		
Germany	0.9	Netherlands	0.9	Canada	9.1		
Spain	0.8	Spain	0.7	Italy	7.4		
Italy	0.7	Italy	0.6	Spain	7.3		

Note: latest time period available. Some figures are not directly comparable.

Sources: Australian Productivity Board; EU Commission Co-Invest programme ; OECD.

Towards a Comprehensive Innovation Review

Our pre-Election Statement set out some of the basic building blocks in building an innovation ecosystem. There has been a welcome shift in recent years away from a focus on what we collectively spend on the innovation systems (public and private) from what comes out – hence the development of the NESTA innovation index. However, an area that still needs far more work is understanding the role and function of institutions within the innovation system and how their work drives innovation within private and public sector institutions. This is central to understanding how a knowledge economy works and how public policy can achieve the biggest impact for any given level of investment. BIS and the Technology Strategy Board (TSB) are already undertaking new work on the innovation system.

Knowledge Economy Strategy 2020

The Work Foundation submission to the Comprehensive Spending Review

As we have argued elsewhere, the traditional focus just on technology transfer is too narrow: The UK is an acknowledged world leader in the economic success of creative and cultural industries but we struggle to say exactly why. The English language is an obvious asset in global market places. But it is also likely a reflection of the strength great British institutions such as the BBC, the national museums and libraries, the British Council and the underlying arts and design infrastructure that has been built up over many years.

However, we think that the scope of review must go even wider to embrace the role of intermediary institutions in areas such as banking and long term infrastructure support. We have categorised intermediaries as follows:

- Financial intermediaries that exist primarily to channel long term capital towards innovative enterprises and big scale investment areas such as the digital, physical and energy infrastructures, such as the proposed Green Bank;
- Innovation specialist driving institutions such as technology and innovation centres¹⁰, parts of the university system concerned with generating and supporting “spin outs”, and institutions promoting the development of the cultural and creative sectors;
- Supporting infrastructure intermediaries that support and drive innovation as a by-product of their existence, such as the higher education system, the BBC and the British Library - and also design, drama, and art schools and other cultural institutions;
- Knowledge service intermediaries that provide specialist and agency services such as design, advertising, IT and computers, labour supply, financial, legal and accountancy, and consultancy and training services;
- Networked SMEs in high tech manufacturing (“manu-services”) and knowledge intensive services that support and in turn are supported by larger companies and organisations;
- Anchor institutions i.e., civic, cultural and intellectual institutions which contribute to the cultural, social and economic vitality of cities, supporting them to thrive and making them resilient to change; often called “sticky capital”.

In short, we need a ***comprehensive innovation review*** to match the comprehensive spending review. The review would have both general and specific aims. The general aim would be to identify gaps in the existing structures and develop proposals to fill them. In doing so, the presumption would be of consolidation – in other words, that existing institutions would be refocused, merged or abolished. This is not just to reflect the current constraints of the public spending round, where less support must be concentrated to get the best effects. One reason why the current map of public sector institutions looks so complex – even in relatively new areas such as the low carbon economy - is that new institutions have been successively added to the existing structures and few if any taken away. The inevitable result is that effort becomes dispersed and uncoordinated and business faces a daunting and confusing set of pathways and gatekeepers in tapping into what support and advice is available which in turn undermines confidence and increases the perceived risk of major long term investment commitments.

A successful conclusion would be fewer institutions, better supported, with a much clearer sense of strategic purpose and how they fit in with the wider system. Wherever possible, “lead” institutions with a strategic responsibility for encouraging and developing innovation across a particular area of activity should be identified, building on successful examples such as the Design Council. Although the exercise would be focused primarily on publicly funded institutions, it should also look at recommendations directed to largely or exclusively privately funded institutions to encourage the same process of consolidation.

¹⁰Examples include the Fraunhofer Gesellschaft in Germany, ITRI in Taiwan, ETRI in South Korea and TNO in the Netherlands.

Much has been written on the strengths and weaknesses of the UK innovation system. NESTA has commissioned some ground-breaking work, BIS has set out authoritative assessments of the current UK innovation system, and the recent establishment of a new academic centre will provide further high quality contributions to the future debate¹¹. The TSB and others have developed sophisticated forward-looking assessments of the implications and opportunities of technological innovation. Thinking on innovation policy in the UK is among the most advanced in the OECD.

Yet the UK still lacks a fully effective and coherent innovation system. This partly reflects the constraints of Whitehall departmental boundaries. The most recent Innovation Report from BIS is strong in traditional areas of innovation policy such as science and technological development and STEM graduates, but has little of substance to say outside of these traditional areas. It is a far cry from the aspiration of 'Innovation Nation' (a white paper produced by the then Department of Innovation, Universities & Skills in March 2008) to make innovation policy the linking thread across all areas of government policy.

Some of the new and reformed institutions that would start to emerge from this would process would include:

- banks & VC in cities and regions responding flexibly to pitches for funds, especially SMEs
- organisations that transfer knowledge between universities, research centres and UK SMEs
- uniquely strong research based universities with prioritised funding and new supporting income streams
- market development institutions – procurement, regulation, overseas opportunity scanning, competition
- “flexicurity” institutions helping workforce accept greater risk in return for employment insurance & life-long learning
- develop role models for entrepreneurship, and
- public sector re-positioned as a lead service innovator in its own right and as a supporting partner of innovation in the private sector
- skills institutions providing the development of lifelong intellectual and cognitive capabilities
- new institutions to support infrastructure development – financial, regulatory and planning

Moving from the general to the specific – building a UK version of Fraunhofer institutes

In order to move beyond the general to the specific we have looked in more detail and how the lessons from the development of one set of intermediaries – the Fraunhofer Institutions in the German innovation system – could be applied in the UK. However, it should always be recognised that national solutions to technology transfer indicates that each institution has features rooted in the path-dependent development of its own innovation system¹². So, while there is much to be learned from overseas models both in terms of their successes and their weaknesses, solutions cannot simply 'cut and paste' between countries¹³.

¹¹ NESTA's innovation index for example gives an overview of the UK's innovation performance, allows sectoral comparisons, and assesses how wider conditions such as skills, infrastructure, and demand help drive innovation. In 2008 the UK Innovation Research Centre (IRC) was set up to provide high quality research to help support the future development of innovation policy.

¹² **Simmie J., Carpenter, J., Chadwick, A. and Martin, R.** (2008) 'History Matters: Path dependence and innovation in British city-regions.' London: NESTA; **Mina et al** (2010) 'Models of Technology Development in Intermediate Research Organisations' Imperial College London Business School Summer Conference June 16-18

¹³ **Hauser, Hermann** (2009) The Current and Future Role of Technology and Innovation Centres in the UK: BIS, <http://snipurl.com/108fjf;> **Moore, Barry, Ulrichsen, Tomas, and Hughes, Alan** (2010) 'the Higher Education Knowledge Transfer System in the US': PACEC / CBR www.pacec.co.uk/documents/USKESystem-FullReport.pdf

However, while the specific operation of the Fraunhofer Institutes are unlikely to translate directly to the UK context, a number of key *principles* – which are central to the Fraunhofers' success – can be identified and applied to the UK:

(a) Focus on national economic strengths and areas with strong growth possibilities

For the UK these all exist within the 'knowledge economy'. In particular we should focus on developing intermediary institutions for the following broad areas of activity¹⁴:

- Advanced manufacturing ('manu-services'¹⁵)
- The cultural and creative sectors
- High-tech services
- The low-carbon economy¹⁶

As we showed above, jobs in knowledge-intensive activities were less affected by the recession than the rest of the economy. The most recent economic and employment figures tell us that manufacturing is starting to grow strongly, and that almost all the net growth in jobs is coming from knowledge intensive services. Initiatives framed to drive innovation and growth in these areas offer the greatest scope for economic returns and value for money.

(b) Develop a small number of powerful and influential intermediaries

While Fraunhofer Institutes are a major regional and national player in the German innovation ecosystem, the UK system is currently more fragmented between, for example, individual university Technology Transfer Offices (TTOs)¹⁷, external intermediate research organisations and Technology and Innovation Centres (TICs)¹⁸ which operate as bridges between universities and firms¹⁹, Research and Technology Organisations (RTOs) which are independent from Universities, and the Research Councils and public sector research establishments²⁰.

In addition, the Fraunhofers range across most of the research-innovation value chain, and have strong interfaces with two other major players which operate in technology transfer in the German innovation eco-system: the Max Planck Gesellschaft (which focuses on 'basic' research) and the Herman von Helmholtz Gemeinschaft network of laboratories. Together these three organisations represent more than €5.2bn annual investment in non-core university research and technology transfer.

¹⁴ Our recent report explains why we can expect to see a rising share of economic activity, innovation, exports and jobs across these four areas of activity - Brinkley, Ian (2010) *Innovation, Creativity and Entrepreneurship in 2020*. London: The Work Foundation, <http://snipurl.com/108gqx>

¹⁵ Organisations which provide high-value services 'around' their manufacturing offering: In the US 60 per cent of manufacturing firms have taken this route compared with just 1 per cent in China.

¹⁶ Levy, Charles (2010) *A 2020 Low Carbon Economy*, London: the Work Foundation, <http://snipurl.com/108gzuz>

¹⁷ Mina et al (2010) *Models of Technology Development in Intermediate Research Organisations* Imperial College London Business School Summer Conference June 16-18 2010, see also Tang (2008) *Exploiting University Intellectual Property in the UK*: Intellectual Property Institute <http://www.ip-institute.org.uk/pdfs/Exploiting%20University%20IP%20in%20the%20UK.pdf>

¹⁸ Hauser (2009) *The Current and Future Role of Technology and Innovation Centres in the UK*: BIS, <http://www.bis.gov.uk/assets/biscore/innovation/docs/10-843-role-of-technology-innovation-centres-hauser-review.pdf>

¹⁹ But are autonomous and independent and are funded through combinations of public and private resources.

²⁰ Oxford Economics (2008) *Study of the impact of the Intermediate Research and Technology Sector on the UK Economy*, May 2008, Oxford

The UK must look to emulate the Fraunhofer Institutes' example and consolidate the fragmented set of intermediary institutions by applying rigorous criteria²¹ for assessing institutions' value to the overall system.²² In a period of constrained public spending it is vital that investment is focused on developing a small but strong network of intermediate institutions.

(c) Ensure a sustainable mixed funding model which is as self-sustaining as possible

The Fraunhofer Institutes have a mixed funding model, with public funding through a central grant, individual institutions receiving support from local government, government commissioned work, and private commissioned work. The element of core funding is guaranteed over a period, which, has been suggested to enhance the ability of institutes to take a more long-term and innovative approach to their work programmes²³.

It is important to note that the Fraunhofers receive a substantial proportion of their funding from public sources (albeit some gained through competitive tender in addition to long-term public commitments) 60 years after their original formation. Continued public funding role is important for innovation, as research models based predominantly on private research contracts and competitive tenders are more suited to *react* to technology trends rather than to *anticipate* them²⁴.

In order to viably re-create any of the kinds of successes of the Fraunhofers, each institute in a UK Fraunhofer network would require a longer-term public commitment of funding for up to 10 years in the first instance, with full and informed reviews of progress every 3-5 years²⁵. In addition, building a portfolio of commercial contracts year on year should also be an explicit target for all UK Fraunhofers.

(d) Build a high reputation as quickly as possible

The credibility of Fraunhofer Institutes is reflected in their 'employer of choice' positioning the German labour market: Fraunhofers are the 2nd most popular employer choice for German Natural Science grads, 4th for ICT graduates, and 7th for engineering graduates.²⁶ The UK government must commit to creating an intermediate institution which can develop to be an equivalent draw for talented individuals with scarce skills. This should be achieved through mechanisms such as high profile commitments from government, ministerial visits, and reports directly to BIS, not just through funding.

In addition the Fraunhofer Institutes have a close relationship with national policy-makers for higher education, business, and technology. A UK set of Fraunhofer Institutes would have to be

²¹ Current criteria for the Fraunhofer institutes include: Scientific competence, proved by the recognition of the scientific community; Well-balanced financial mix of different independent Sources; Market success and entrepreneurial competence proved by contracts with industry and government; and Professional networking with other Fraunhofer Institutes and externals.

²² Zabala-Iturriagoitia, J., et al. (2007) 'Regional Innovation Systems: How to Assess Performance, *Regional Studies*, Vol. 41, No. 5, 661-72

²³ OECD Working Party on Research Institutions and Human Resources (May 2009) 'Analysing the transformation of public research institutions'

²⁴ Mina et al (2010) *Models of Technology Development in Intermediate Research Organisations* Imperial College London Business School Summer Conference June 16-18 2010

²⁵ Connell, David, and Probert, Jocelyn (2010) *Exploding the Myths of UK Innovation Policy: How 'Soft Companies' and R&D Contracts for Customers Drive the Growth of the Hi-Tech Economy*, UKIRC / EEDA, http://www.ukirc.ac.uk/object/report/3341/doc/full_report.pdf; see also the *Research Councils UK* response to the Hauser Report, www.foundation.org.uk/events/pdf/20100518_Delpy.pdf

²⁶ Egner, Harald (2010) presentation to BIS on Fraunhofer Institutes, February

appropriately responsive to market needs, but also should benefit from close integration to the national policy infrastructure.

(e) Strong governance, but contractual flexibility within individual institutions

The Fraunhofer Institutes are managed on a ‘federal’ model, which provides stability and national profile as well as local flexibility. A single board agrees major elements of strategy, and shapes the 7 key research themes which stretch across the 60 individual institutions. However, individual institutions have wide powers to negotiate individual research project contracts, and to establish inter-institutional links for themselves.

Some of the principles and lessons applied

A UK set of Fraunhofer Institutes should also be seen explicitly as a *national* level network, with single over-arching governance structures, while allowing individual institutions the flexibility to manage their portfolios of research and development projects independently. Success will depend on matching these national institutions with local economic strengths as well as the aspirations and plans of the developing Local Enterprise Partnerships and their constituent local authorities.

As an intermediary institution, the Fraunhofer Institutes are focused primarily on linking academics, academic institutions and research, and private enterprise. As such it offers a strong and successful example of an intermediary institution in a national innovation eco-system. However, from the point of view of the range of potential intermediary institutions in the overall innovation eco-system for the UK, we believe such a focus is too narrow.

The Fraunhofer Institutes operate effectively because they focus on well-developed German links between universities and businesses in engineering and manufacturing. However, some UK strengths where intermediate institutions might be usefully deployed lie outside the traditional university-industry links. Some examples:

Health Services²⁷: Measured by shares of employment and GDP, health services are a bigger part of the UK’s knowledge economy than education. Health technologies and healthcare systems are identified as key growth areas for the future by the OECD. Intermediate institutions – as part of a Fraunhofer-style network – could link key organisations like the NHS, and industry.

Management innovation²⁸: The UK’s expertise in professional services and management techniques continues to be sought-after globally. Process and management innovations which spring from the UK’s world-beating creative industries, or from business schools and consultancies, can also be supported by good intermediate institutions, as recent research comparing the Nordic countries’ innovation systems indicates²⁹.

²⁷ E.g. Liddell, Alasdair, Adshead, Stephen, and Burgess, Ellen (2009) *Technology in the NHS*, Kings Fund, www.kingsfund.org.uk/document.rm?id=8076 Some institutions already exists and recent pilot work undertaken with NHS Employers as part of The Work Foundation’s Knowledge Economy programme suggest there is great unmet potential to tap the public sector’s intangible asset base

²⁸ Birkinshaw, Julian, Gary Hamel, & Michael Mol (2008) ‘Management innovation’ *Academy of Management Review*, Vol. 33, No. 4, 825-845

²⁹ Ramstad, Elise (2009) ‘Expanding innovation system and policy - an organisational perspective’, *Policy Studies*, Vol 30, No 5, pp533-53

Knowledge Economy Strategy 2020

The Work Foundation submission to the Comprehensive Spending Review

Public service innovation³⁰: Public service innovation can be a big driver of organisational and technological change to improve quality – provided the right incentives and structures can be put in place³¹.

General Purpose Technologies³²: In terms of economy-wide innovation General Purpose Technologies (GPTs) are the very-long-term drivers of value. Being at the forefront of the ‘next’ innovative GPT appears to be of massive benefit to any national economy. GPTs are as much about process as about product, and intangible investments as tangible³³. Intermediate institutions should also be able to support the possibility of these kinds of innovations.

But beyond the Fraunhofer model linking industry and research we believe that the role of intermediary institutions in the UK innovation eco-system needs to be better mapped, focused and developed. While government can support the development of some form of Intermediate Research Institutes, the crucial element here is an examination and consolidation of current UK innovation systems, to build on the considerable amount of successful innovation and technology transfer already taking place and the significant number of intermediate institutions already in existence in this country.

- Look to the principles evident in the Fraunhofer model to create a UK equivalent network of intermediary institutions, particularly focusing on the ways in which fewer, more focused, and better-funded intermediary institutions could be created.
- Build the network gradually, in areas of existing UK strength, and in areas of economic activity which are likely to see strong job and value growth in the next 10-15 years.
- Provide individual institutions in the network with stability of funding – at minimum for 10 years. But require these institutions to increase their proportion of funding gained through competitive tenders – public and private – year on year. This longer-term comment is needed to ensure the UK has and continues to have the right institutional mix to sustain the recovery from the recession through to 2020.
- Give immediate priority to a clearer mapping of the current strength of intermediate institutions in the UK innovation eco-system, so that prioritisation and consolidation can be expedited. This mapping must move beyond counting and relating institutions, to consider the effectiveness of intermediate institutions as a mechanism of innovation and growth, against UK potential growth sectors.

Skills and the knowledge economy

Progress towards the knowledge economy is transforming the world of work. Knowledge intensive work depends on the use of ‘tacit’ knowledge that resides in people’s minds in the form of expertise or experience, rather than being written down in manuals, guides lists and procedures. Productivity here depends on deriving value from intangible assets such as research and development, IT,

³⁰ Lehki, Rohit (2008) *Public Service Innovation and the Knowledge Economy*, London: The Work Foundation

³¹ Brinkley, Ian. (2010) *Innovation, Creativity and Entrepreneurship in 2020*, The Work Foundation

³² E.g. the printing press, the 3-masted sailing ship, the steam engine, railroads, and the internet

³³ Helpman, Elhanan (ed.) (1998) *General Purpose Technologies and Economic Growth*, Cambridge, MA: MIT Press

branding and advertising, and organisational development. These activities depend heavily on the types of high-level skills often gained at universities – at its core a degree reflects an ability to use tacit knowledge to assimilate, interpret and use a range of specialist information.

Our work has shown that a significant minority of knowledge intensive jobs (measured by the share of working time devoted to knowledge intensive tasks) are undertaken by non-graduates, and that some graduates are undertaking jobs that require relatively little knowledge intensive activity. Skills development cross the workforce is therefore of importance to the knowledge economy, not just graduate level skills.

However, despite the immediacy of the problem and the negative consequences of delayed action, our skills system and the debates that surround it progress at glacial speed, if at all. The 2003 Skills White Paper identified almost exactly the same issues as the 2009 White Paper and the analysis by the UK Commission for Employment and Skills in *Ambition 2020*. Lorna Unwin, Professor of Vocational Education at the Institute for Education, goes even further, noting the “acute sense of *déjà-vu*” that “permeates analyses of the labour market and skills’ policies over the past 30 years”.³⁴

The issues that attract the most attention appear to be the most intractable, while definitions and consensus around ostensibly key concepts such as ‘economically valuable skills’ remain vague. The system’s focus on qualifications has also led to tunnel-vision about issues related to skills and the changing nature of work. There are some puzzling “big picture” anomalies in the evidence. that seems to be unresolved despite large sums spent trying to find answers – yet without some resolution the best future direction for policy remains uncertain. The current development of a more policy orientated research programmes by organisations such as UKCES may help fill in the gap.

There is a huge amount at stake. While a high-skill, high-value added economy is the only option to remaining a prosperous nation in a global economy, post-recession austerity will require new choices and new approaches to achieve this future. Skills policy needs to be clearly focused on what problems it is trying to solve, with the policy prescriptions, frameworks, and institutional structures flowing from that focus.

Skills problems have typically been seen in terms of shortages, but the evidence suggests this is no longer a problem for the UK economy as a whole³⁵. Against this, surveys routinely show that large proportions of employees say that they are under-utilised in their jobs – in other words, that they could do more than their job currently demands of them. If this is the case, the big problem is less a supply one and more what we do with skills once people have entered the workforce. Our own work on knowledge workers³⁶ confirms this is a problem regardless of the knowledge intensity of the work, but is most acute the less knowledge intensive is the task. This is not a very robust measure³⁷ and it may have little to do with skills – for example, it is quite possible individuals have outgrown their jobs as they become more experienced, in which case the skills system can do little to address the underlying problem which is job design and internal development systems.

³⁴ Unwin (2010), ‘Learning and working from the MSC to New Labour: Young people, skills and employment, NIER, No. 212.

³⁵ There may of course be much more acute problems in some specialist areas. For example, it is likely we will be facing a world-wide shortage of engineers specialised in nuclear power.

³⁶ Fauth, Mahdon and Brinkley (2009) *Knowledge Work and Knowledge Workers* The Work Foundation Knowledge Economy Programme report.

³⁷ It is often hard to get much idea of what the extent of underutilisation really is and how serious it might be, let alone how much is really caused by lack of skills. Moreover, a different set of questions asking employers whether skill deficiencies are holding back their business typically give much lower figures.

UK employers have also been berated for a lack of overall investment in skills. The evidence for this is usually international comparisons of qualifications where the UK scores less well on intermediate and lower level skill levels. Yet the evidence from the research on intangible investment shown above suggests UK employers invest a lot in human capital by international standards³⁸. It may be that the core problem is distributional: that UK employers invest most in those who already have higher level skills. It may also be that UK employers have to invest more to get their workforces up towards the standards of their international competitors because of the relative neglect of technical and vocational skills within the UK educational system.

The focus of this submission is however on high level (graduate skills) for the knowledge economy, drawing on a forthcoming report by The Work Foundation on skills and the knowledge economy³⁹. Although knowledge intensive work is by means a graduate monopoly, there is a strong and enduring association between the rise of knowledge intensive work and the expansion of graduate level skills. What happens to the demand and supply of graduates in terms of both quantity and quality is one of the most determinants for how the UK's knowledge economy can develop over the next decade.

Although we look at graduates largely in a UK context, a global labour market exists for some forms of graduate level skills. We have previously argued the importance of relatively liberal migration policies for high skill jobs. Knowledge intensive economies rely on the rapid dissemination and practice of the latest ideas and knowledge from around the world, and the relatively free flow of people with high level skills is one way of facilitating that movement. The UK is unlikely to be able to fully meet all its demands for knowledge workers from domestic supply alone. Those firms and sectors that are high "importers" of high skill labour also tend to be the ones making the highest investment in the skills of their UK based workforce. There are significant advantages in encouraging bright young people from around the world to study here, not least in increasing the ability of the higher education sector to export education services to markets already familiar with the quality of UK educational institutions. Global companies need flexibility in deploying their best and brightest people where they are most needed and in accessing high quality skills across national boundaries. We therefore have reservations about the more restrictive migration policy recently introduced and the operation of a "cap" on non-EU migrants.

Much has been made in recent years of the idea that the expansion of higher education has been too fast, and that too many graduates are now entering 'non-graduate' jobs. However evidence shows that graduates remain in strong demand across the OECD. Wage data certainly does not suggest that the UK has a long term over supply of graduates.

Many have expressed concern that the recession has upset the balanced growth path of higher education provision. Young people have certainly been disproportionately affected by the recession, and many graduates are struggling in the current labour market. However, the response of the labour market to the recession has reinforced the need for a highly skilled workforce. As with previous recessions, the vast majority of jobs that were lost were in manual, unskilled and elementary occupations. Less than 10 per cent of jobs were lost in 'knowledge associated jobs' which accounted for 45 per cent of pre-recession employment. This pattern has been reflected on a sectoral basis with job losses concentrated on less knowledge intensive services such as construction and distribution as well as low to medium tech manufacturing. It seems that the recession is accelerating the long term process of structural change towards the knowledge economy.

³⁸ The measures on intangible investment by firms in human capital are in research terms in their infancy. Although they use common methodologies, data coverage, quality, and comprehensiveness all differ.

³⁹ Levy and Hopkins (2010) Skills and the Knowledge Economy, The Work Foundation Knowledge Economy Report.

The evidence presented here tells a clear story. Structural change in the economy is creating a strong and increasing need for more highly educated workers – a need to which the higher education sector has been responding well. This need has been increased by the response of the labour market to the recession. Given this evidence, it is essential that this summer's comprehensive spending review is able to maintain the expansion in the graduate outputs from the higher education sector.

Delivering the right graduates for the knowledge economy

Successfully delivering the skills for the 2020 knowledge economy will depend not only on producing the right number of graduates, but also on the system supplying graduates with the right specific qualities. While this will in part depend on delivering graduates with the right practical skills (enough trained engineers, statisticians and lawyers for example), such a narrow focus would ignore the important feedback impacts of education. Education not only meets demand from the economy, but it also drives the economy by supporting innovation.

To date, public policy has focused on two responses to the vexed question of influencing the balance of subjects studied at university. The first has been the focus on 'economically valuable' degrees. However, developing policy actions from this has proved challenging. The other key area of attention has been STEM (Science, Technology, Engineering and Maths) subjects. These have a special role within innovation. They are particularly important to the processes of scaling up new knowledge to create products and services which are of value.

In response to pressure from perceived skills shortages, pressure from employers and the very low numbers of researchers within the labour force, the Government have sought to boost the numbers of students studying STEM subjects. However, this graduates supply focused response is only a partial response to the issues.

The low numbers of researchers and the skills shortages in STEM subjects represent a puzzle. The proportion of the UK's graduates entering STEM courses is among the highest in the OECD, and the proportion of science graduates among 25-34 year olds in employment is also high. Also significant effort has been made to increase uptake and attainment in STEM subjects. This has been increasing at all levels without alleviating perceived shortages.

Our analysis suggests that the key issues relate to the operation of demand for STEM graduates rather than the volume of their supply. Most importantly, it seems that higher education institutions are not producing the quality of graduates demanded by employers. Rectifying this will demand a focus on initiatives which can encourage STEM graduates into industry, action to strengthen the quality of STEM degrees and to boost industry and entrepreneurialism skills for graduates.

The government should replace current system of bids for an additional 10,000 STEM and other vulnerable subject places with a broader competition for additional places in courses that specialise in boosting the innovative stock of the economy. It might be sensible to leave it to universities to innovate and to present bids defining what this means and how they can boost the innovative potential of their students.

Funding higher education

Higher education represents a major draw on public resources. Sustaining the expansion of provision and intervening to influence the mix of subjects studied at university would both be costly activities. These needs contrast with the current financial situation of the sector as it is likely to see a substantial fall in public funding.

Currently UK spending on higher education as a percentage of GDP is comparable to the EU average, but below the OECD figure. Spend per head on tertiary education in the UK is however above the OECD average, and between 1995 and 2005 increased by 15 per cent. This spend per student is however dwarfed by the American figure, which grew at over twice the rate during the same period. While UK institutions receive a higher proportion of their funding from private sources than their main EU competitors, we lag behind many of the larger OECD economies on this measure.

This strong growth in funding is unlikely to be sustained under current arrangements. Following the Chancellor's emergency budget in June, we can expect 25 per cent cuts across all non-ring fenced budgets. Commitments to protect spending on defence and school level education are likely to necessitate deeper cuts in budgets such as higher education funding.

Given this context, the final section of the report considers how well the three main options presented for reform would perform in the context of three overriding priorities for the higher education sector:

- Supporting the continued expansion of the higher education sector to serve the knowledge economy, while also maintaining teaching standards;
- Maintaining access to higher education on the grounds of student ability; and
- Promoting competition within the sector.

Option 1 – an efficiency agenda should be viewed as the base case or minimum change scenario. This scenario could see per student funding levels return to the levels seen in the mid 1990s. With caps on student contributions fixed success would depend on delivering higher education more cost effectively. Such an approach would certainly not provide any potential to expand provision. It is also unclear whether savings on this scale could be achieved without compromising teaching quality. The approach would also fix in the long term the income which universities can receive from students. This could impact negatively on competition as universities focus on competing in areas where additional revenues can be derived.

Option 2 – increased student contributions would certainly allow for the continued expansion of higher education provision, without compromising teaching standards. Implemented in a way which promoted differential pricing of higher education, this could represent a particular boost for competition within the sector. There are concerns however that these reforms could hurt participation in higher education of students from lower socioeconomic backgrounds, particularly since implementation would be likely to necessitate reform of the student loans system.

Option 3 – a graduate tax offers the opportunity to pay for higher education based on the earnings of graduates. The conceptual strength is that the graduates who earn the highest salaries will contribute the most towards their education. This system would be unlikely to deter disadvantaged groups from accessing higher education, and if implemented in a decentralised form could drive competition between institutions based on how well they train their students. Unfortunately there are many technical obstacles. The most important of these relate to timing (how long it would take for tax receipts to replace current revenue sources), migration and international students (how a commitment to this tax could be ported across national borders).

There is no perfect solution for reform. Pursuing a pure efficiency agenda is unlikely to allow the system to deliver sufficient numbers of graduates, with adequate quality training for the 2020 knowledge economy. Given the technical limitations of a graduate tax it is unlikely to be of as a solution to current funding challenges, although it seems sensible to maintain the resolution of these issues as aspiration for the future. It is clear therefore that there is only one viable option for reform of higher education funding – to increase tuition fees, and to reform the student loans system.

- **Skills policy should be focused on the central problems of under-utilisation of skills in the workplace and the distribution of skills investment across the workforce;**
- **The higher and further education system must continue to expand capacity to meet the continued rising demand for higher knowledge intensive skills;**
- **This must be complemented by a less restrictive migration policy for high level skills, encouraging overseas students and giving global companies flexibility in meeting their high level skill needs;**
- **The key issue with STEM skills is no longer supply, but demand related issues including concerns with the quality and relevance for the needs of modern industry**
- **The expansion of higher education without sacrificing quality must come from a greater private sector contribution, primarily higher student fees accompanied by reforms of the student loan system and greater freedom for universities in setting fees.**

Knowledge economy industrial strategy

The Coalition government has said that it wishes to focus on horizontal measures that set the framework for industries to prosper, but which do not involve picking winners (eg favouring particular firms as national champions). We broadly endorse this approach. However, this should not be interpreted as indifference to the fortunes of particular companies when in particular segments of the market only one or two firms dominate an entire sector. Government support may be required when events beyond an individual companies control threaten future investment in the UK. Moreover, in practice policy may have to be more selective than a “purist” approach would dictate. In this submission we look at three areas where a mix of specific and cross-cutting measures will be needed:

- R&D investment
- Support for SMEs
- Building the Low Carbon Economy

It has been demonstrated that without public support the amount of R&D undertaken in the UK would be less than ideal from national point of view. The UK’s record on R&D investment is unimpressive when compared against some economies although it sits slightly above the EU average (measured as a share of GDP). Public support for R&D is therefore a long established way of correcting a national weakness.

Without in any way questioning the importance of R&D and its continued support – it is as we show one of the key “ring fenced” priorities for the next decade – the long-standing objective of UK governments and the EU to raise the share of GDP spent on R&D is fundamentally misconceived. R&D is highly sector specific, and the share of R&D in GDP is therefore partly determined by industrial structure. Across the OECD there is no long run upward trend in the share of GDP – indeed, if anything it is lower now than it was 30 year ago. We have argued that we need a more sector specific approach, one which focuses on R&D investment in key sectors such as aerospace, pharmaceuticals and high tech services and on cross-cutting areas such as green technologies⁴⁰.

What form that intervention takes is more debateable than the principle of intervention. Many OECD economies have moved some resources from direct funding of R&D to indirect support via tax credits. The effectiveness of such measures, at least in the UK, is largely untested. Some economies, such as Germany, hardly use tax credits at all. Latest international evidence suggests the UK’s tax credit system sits in the “middle” in terms of relative generosity⁴¹. Some economies have introduced variations that offer higher credits for R&D undertaken in partnership with universities.

The R&D tax credit may or not be an efficient way of supporting R&D, but without a more robust evidence base it is hard to say whether or not it should be a continued priority. In our view it makes more sense to think about more specific measures that either increasing R&D in particular R&D intensive sectors or for particular activities, such as green technologies. This should not be limited to fiscal measures, but also to the overall conditions that will prompt global firms to locate R&D in the UK as opposed to either their home market or Asia. Moreover, sectors described as “low tech” because they invest relatively little in R&D as defined by the OECD will nonetheless often be closely connected with the output of the scientific base which is supported by investment in R&D⁴². Making sure we have the right institutions that allow the .benefits of R&D to be widely dispersed as rapidly as possible is equally as important. Recent research suggests – albeit tentatively – that direct funding of public R&D undertaken through the UK research councils offers the greatest “spillover” effects.⁴³

- **R&D support should be made more sector and activity specific, focused on the R&D intensive sectors (aerospace, pharmaceuticals and high tech services) and green technologies;**
- **R&D tax credits should be reviewed to see if they offer value for money and a more direct link to promoting joint research work with universities considered;**
- **Direct funding for public R&D should be concentrated through institutions where spillover effects to the wider economy are maximised.**

Enterprise policy

Our previous report *Knowledge Economy and Enterprise* highlighted the special role of SMEs within the knowledge economy. Our findings showed that the UK does not need more small business or a higher rate of business start-ups. Instead, the economy needs to turn a higher proportion of firms into the high growth firms which will generate jobs in the recovery.

In previous work we used the original categories devised by an American economist, David Birch, to describe the firm population. He divided it into “elephants” (slow moving corporate giants who shed jobs); “mice” (small firms who remained small) and “gazelles” (fast growing small firms that

⁴⁰ The Work Foundation evidence to the House of Commons Industry Committee, 2009.

⁴¹ OECD (2009)

⁴² Smith et al (2005)

⁴³ Haskins and Wallis (2010)

created most of the new jobs). This is still a useful way of thinking about the firm population, but subsequent recent research shows it was only a partial view.

Gazelles are a sub-set of “high growth firms” who come in all sizes and more often than not are well-established. High growth firms are the big job generators, with large firms contributing at least as much as SMEs. Both are rare – a few hundreds of large firms and a few thousands of SMEs in the UK – yet in both the UK and the US they generate almost all the new jobs⁴⁴. However, even if gazelles are less important than we once thought, they are still a major focus for policy because it is this group for which the need for public intervention to overcome market failure is likely to be greatest.

Policy has struggled to keep up with these developments and in some respects has gone backwards. Over the past twenty years enterprise policy has moved through three stages – a traditional focus on the quantity of SMEs characterised by across the board support measures; a stronger focus on an enterprise policy with a greater focus on improving the quality of growing SMEs; and the first stages of an emerging high growth firm policy. Recent policy measures set out in the Budget have returned to the traditional agenda, with the across the board regional subsidy for SMEs who take on new workers. We think this will prove wasteful and inefficient⁴⁵.

Moreover, it is hard to escape the impression that business support at local level is poorly equipped to interact with and support high growth firms, having been focused on offering a small amount of fairly basic advice and support to the greatest number of firms⁴⁶. The consolidation of basic advice services at the national level by BIS seems sensible. However, it is also important to encourage the refocusing of local support services so they are better able to handle HGFs rather than dissipate efforts across a vast number of “mice”. We will be following this up in more detail through our *Cities 2020* research programme.

- **Enterprise policy should be clearly focused on high growth firms, with particular attention to removing barriers to growth for smaller HGFs;**
- **The regional employment premium is wasteful and ineffective and should be phased out with the cash transferred to LEPs;**
- **Local business services should be refocused away from across the board general support to a more selective and faster response responsive to faster growing firms.**

The low carbon economy

Knowledge economies cut across industrial boundaries in ways that encourage cross-sectoral approaches. A good example of how a new cross-sectoral industrial strategy can work in practice is support for the low carbon economy. In our review of the low carbon economy published earlier this year⁴⁷, we found that the UK starts with major advantages. Policy thinking is well-advanced and a number of promising initiatives are underway. However, current policy fails to meet fully the needs of the low carbon economy. Uncertainty relating to the future returns from investment in many low carbon activities remains a barrier. Demand in particular, remains inadequate and too unreliable to support the development of many product and services offers.

Given these gaps, and the strength of the justification for public intervention in this area, we advocate rapid action to better support the continued development of low carbon economic activities. However, reflecting the current constrained context of public finances, these recommendations focus on the development of clear long term investment frameworks, and the

⁴⁴ Anyadke-Danes et al (2009)

⁴⁵ The Work Foundation Budget commentary, April 2010

⁴⁶ The Work Foundation Knowledge Economy seminar, July 2010.

⁴⁷ Levy (2010) *A 2020 Low Carbon Economy*. The Work Foundation.

provision of consistent and simple messages of support from the public sector, rather than calling for extensive additional spending. They focus on reducing uncertainty through policies focused on both the supply of and demand for low carbon economic activities.

Better Supporting the Supply of Low Carbon Economic Activities

Current confusion regarding public support for the supply low carbon economic activities is a cause for concern. Action is required to better understand the nature of current public support for these industries before this can be simplified and rationalised:

- **A cross cutting audit of current spending** is required to better understand current spending patterns, and identify areas for potential rationalisation. It is essential that this audits allow a distinction to be drawn between public monies which support the supply of low carbon activities, and that which aims to develop its demand;
- **A single point of contact for businesses**, responsible for supporting access to public funding and advice. Public support available to business and individuals looking to invest in activities related to this agenda is highly confusing. This could be developed from one of the bodies and be funded from the rationalisation process.
- **Form a single low carbon economy fund, linked to the long-term ambitions of the Climate Change Act.** In order to offer long-term certainty about the continuing public commitment to support these industries it would be sensible to distance financial support from short term political debates.
- **Creation of a ministerial role** responsible for championing the needs of these businesses, and ensuring that all departments take responsibility for this agenda would help to meet this need. Mirroring this call for clarity in support for low carbon activities, action is required to ensure consistent, co-ordinated and supportive regulation of these activities from across the public sector.

Better Supporting the Development of Demand for Low Carbon Economic Activities

Uncertainty regarding the future demand for low carbon goods and services is limiting investment in these areas. Potential investors can not be confident about either the level of future demand, or how frameworks will develop which allow them to earn returns from investment in low carbon product and service offers. Given that the government have committed the UK to a low carbon transition, that the need for investment in many areas of infrastructure has been agreed, and that additional investment is needed to develop new low carbon industries there is an urgent need to offer certainty in this area. The following actions would help to address this:

- **Establishment of a vision for the development of the UK's low carbon infrastructure** covering all areas of infrastructure including transport, telecommunications, housing, green belts and open space, waste management, as well as energy supply. It is essential that, unlike existing infrastructure planning, this vision reflects a joined up approach which recognises the importance of the interaction between these forms of infrastructure. Although developing such a vision represents a major challenge, there is potential for this to build on the current work of Infrastructure UK, and the spatial analysis contained within the Barker and Eddington reviews as well as the emerging National Policy Statements;
- **Implementation must support private investment in this infrastructure:** this must include clarity regarding the required balance between public and private funding for infrastructure items and creating attractive investment opportunities for the private sector, and potentially the development of new institutions to support the financing of these

schemes; and ensuring that this vision is rapidly translated into **planning policy** to support its physical delivery.

- **Stronger signals regarding the future costs of emitting carbon dioxide are required** to support the development of demand for all low carbon economy activities. A commitment to tighten the existing EU permit system, and to a future minimum cost of permits could represent a credible way to achieve this, and could allow for a smooth integration with any strengthened EU commitments, or any likely future OECD system.

By offering clarity in public support for these activities and sending clear signals regarding their future development, the successful implementation of these recommendations has the potential to establish a positive and self reinforcing process. The expansion of these activities will support the attraction of additional investment in the UK's low carbon economy as the uncertainties detailed above come closer to resolution.

The geography of the knowledge economy – redefining urban policy

Much of the UK's private sector knowledge economy before the recession concentrated in the Greater South East and a number of cities in the rest of the UK. Policy makers at all levels must balance securing the strengths we have with building new ones in places that lack them.

The Coalition Government has recognised that geography matters, with the Emergency Budget providing measures to encourage firms to create jobs outside London and the South East and a focus on Local Enterprise Partnerships – business-led sub-regional economic partnerships with economic development remits – as vehicles for economic growth. But, whilst we now understand the broad geography of recession – that it was the 'usual suspects' in the North, Midlands and Wales that were most affected - we know little about the potential geography of the recovery and therefore the policies that might be most appropriate to drive economic growth.

Understanding how the model for economic growth is changing and which areas are likely to thrive over the next ten years – as well as where is likely to struggle – will be critical for policymakers, forced to prioritise how they invest limited public money in order to generate the highest economic and social returns.

The recession had a familiar and striking economic geography. Former industrial cities with large manufacturing sectors were hit hard. Cities with highly skilled populations were resilient, and those with low skilled populations experienced the largest increases in unemployment. Because of this the impact was often worst in those cities which had seen the least growth in the preceding period: cities such as Birmingham lost jobs where there had been little gain the decade before. Alongside this, a few boom cities - such as Milton Keynes and Swindon - saw large increases in unemployment as a relatively small number of large firms closed.

Recent work on urban policy has tended centred on the tension between policies which focus on creating growth in these cities and those which focus on managing their decline. The argument for managed decline is based on the – perfectly reasonable – assumption that policy should focus on individuals, not places. Letting those who live in social housing move more easily to areas with better employment prospects is one aspect of this. This implies that less successful cities should shrink, and that successful cities should be allowed to expand⁴⁸. These approaches are essentially based on a view of cities as open economies which should be allowed to grow and decline over time, and that the best way of allowing this to happen is not to restrict barriers to movement or growth but to let the market decide the optimum population levels for these cities.

⁴⁸ Tim Leunig and James Swaffield (2008) *Cities Unlimited: Making urban regeneration work*, London: Policy Exchange.

Allowing individuals to move is the right thing to do. People who do not live in social housing are allowed to move to find work, and if the social housing system restricts movement this will have real human costs. But while the approach is reasonable in practice, it leaves open a number of unresolved issues. The extent to which people would be willing to make this move is not as clear in the UK as in countries with a tradition of population mobility. Individuals are financially and socially attached to the places where they live and there are often other considerations such as partners who may be in employment and children who may be at school. We should not pretend there is always abundant demand for unskilled labour, even in the most successful cities. London has a highly successful economy, yet large numbers of its residents are unemployed.

There are also implications for cities, as population decline needs to be managed – Americans have been dealing with ‘shrinking cities’ for some time now, but cheap and easy solutions have proven elusive⁴⁹. We also know that the residents of many of the more successful cities are highly resistant to growth (and largely successful in their efforts to prevent new developments nearby)⁵⁰. Movement towards a more laissez-faire or market-led economic development policy of cities in this form is therefore not only challenging in a political sense – not least for a government that has publicly committed to support economic growth outside London and the South East and to local control over planning – but also on a practical level.

The second option is policies which attempt to stimulate growth in less successful cities through a selection of policy interventions. Any processes of managed decline are unlikely to work for some time meaning there is still an important role for government to shape the economy of cities. It is feasible for policies aiming at managing decline and attempting growth to operate simultaneously (cities such as New York have been resurgent from positions of apparently unstoppable decline before).

Government needs to ensure:

- **Venture capital is strengthened in public sector dependent regions – and particularly less successful cities.** The markets for venture capital are still skewed to London and the South East. The government needs to focus on ensuring appropriate and available finance for high-growth SMEs everywhere, but particularly in regions where there is currently a gap in private sector financing. This could be achieved through a more diverse range of financial institutions. The government has already indicated a willingness to work with the banking industry on this, but needs to prioritise lending in less successful cities.
- **Focus policy on high growth SMEs.** Rather than a blanket policy for all SMEs, policy needs to focus on those with the potential for rapid employment growth. This means support for innovation, access to growth finance and an improved digital infrastructure.
- **Maximise the public sector in less successful cities.** In many cities the public sector is the major contributor to the local economy. More directed procurement from the local authority can support the growth of local SMEs and also drive forward innovation, for example the Wakefield street lighting case study.
- **Ensure anchor institutions are linked to LEPs.** LEPs will be business led, but in many cities anchor institutions – such as museums, hospitals or sports teams – are vital for the local economy. For example in Mansfield, West Nottinghamshire College worked with the construction company SKANSKA to provide local people with work on the redevelopment of the Kings Mill Hospital. Anchor institutions need to be included early in the planning for LEPs.

⁴⁹ Alan Mallach (2010) Facing the urban challenge, Washington DC: Brookings.

⁵⁰ Paul Cheshire and Stephen Sheppard (2002) “The Welfare Economics of Land Use Planning”, *Journal of Urban Economics*, 52, 242-269.

Labour Markets

All cities currently face challenges in the labour market. A spatial approach is highly important to addressing these. The government should:

- **Remove barriers to movement from less successful cities – but consider the implications for those left behind.** Reforming the social housing system to allow individuals to move to areas where there are more jobs is important, but we need to ensure that it is not coercive and we should not have expectations that large numbers will move, at least in the short term. Importantly, we need to have consideration for those left behind in cities.
- **Make connections between successful and less successful cities.** The LEPs will be smaller than regional bodies, but they need to continue to have a focus. This means ensuring linkages between the economies of successful cities and other cities which do not have the critical mass to attract investment. Our work on city relationships shows that by understanding that different places have different roles in the functional economy. Making links between disadvantaged cities and more affluent areas can ensure they have a social and economic role – either as cheaper places to live within the area or supplying land/labour for supply chain activities that are lower down the chain.
- **Ensure labour market policies are locally appropriate.** There is a danger that simplification of labour market policies leads to excessive centralisation, stifling the ability to innovate at the local level. The coalition needs to ensure that DWP policy at a national level reflects the very different labour market situations of different cities. This will be especially important as the new approach to welfare policy is implemented.
- **Recognise that sustainable growth is about building up and not circulating talent.** It is essential that educational attainment is driven up in failing cities to increase the share of high skilled labour within the local population. There is a clear positive relationship between high skills and economic prosperity within the UK.

Leadership

The centrepiece of the coalition's policies for cities – Local Enterprise Partnerships – will be business led and have considerable strength. In some ways they develop and build on previous initiatives such as MAAs and Local Area Agreements. Previous experience suggests that for LEPs to realise their full potential, a number of actions needs to be taken:

- **Ensure Local Enterprise Partnerships have clarity of purpose, strategies and powers.** To be successful they need to be more than just a mechanism for making cuts locally. This means making sure they have a key role in driving enterprise, innovation and economic growth in the local area (although some of these functions are now conducted nationally). Even in a time of cuts, it is important some resources are found for this.
- **Create local innovation panels – integrated into the LEPs.** Action needs to be taken to drive the economy through local leadership. One way to do this is to create innovation panels, running city based innovation funds which will support clusters and knowledge diffusion.
- **Ensure that weak cities do not have weak Local Enterprise Partnerships.** There is a danger that business led LEPs provide the worst services in exactly those cities which need them most, whereas cities with strong economies and private sectors create strong bodies. Also, competitive bidding for the Regional Growth Fund may exacerbate existing

inequalities as the stronger partnerships and stronger LEP's may continually win out over the weaker ones (as was the case in City Challenge).

Conclusions and recommendations

In this submission we have identified some of the key priorities we think should inform the outcome of the Comprehensive Spending Review. These are summarised below:

- **The government must make a long term commitment to support the following areas of the Knowledge Economy:**
 - Science, technology, R&D, design and creative sector support budgets
 - Higher education
 - Public investment in the physical, energy and digital infrastructures
- **There should be a Comprehensive Innovation Review to match the Comprehensive Spending Review to build an UK innovation system over the next ten years. This would include:**
 - Creating a UK equivalent of the Fraunhofer model network of intermediary institutions, in which fewer, more focused, and better-funded intermediary institutions could be created;
 - Build the network gradually, in areas of existing UK strength, and in areas of economic activity which are likely to see strong job and value growth in the next 10-15 years;
 - Provide individual institutions in the network with stability of funding – at minimum for 10 years - while requiring these institutions to increase their proportion of funding gained through competitive tenders – public and private – year on year;
 - Give immediate priority to a clearer mapping of the current strength of intermediate institutions in the UK innovation eco-system, so that prioritisation and consolidation can be expedited. This mapping must move beyond counting and relating institutions, to consider the effectiveness of intermediate institutions as a mechanism of innovation and growth, against UK potential growth sectors.
- **The higher and further education system must continue to expand capacity to meet the continued rising demand for higher knowledge intensive skills.**
 - The expansion of higher education without sacrificing quality must come from a greater private sector contribution, primarily higher student fees accompanied by a reforms of the student loan system and greater freedom for universities in setting fees;
 - The key issue with STEM skills is no longer supply, but demand related issues including concerns with the quality and relevance for the needs of modern industry;
 - There should be a less restrictive migration policy for high level skills, encouraging overseas students and giving global companies flexibility in meeting their high level skill needs;
 - Skills policy should be focused on the central problems of under-utilisation of skills in the workplace and the distribution of skills investment across the workforce

- **A targeted Industrial strategy for the knowledge economy should focus on four key growth sectors: advanced manufacturing, the creative and cultural sectors, high tech services, and low carbon economy. Specific actions are required to support R&D, high growth firms, and the low carbon economy**

Targeted R&D support

- R&D support should be made more sector and activity specific, focused on the R&D intensive sectors (aerospace, pharmaceuticals and high tech services) and green technologies;
- R&D tax credits should be reviewed to see if they offer value for money and a more direct link to promoting joint research work with universities considered;
- Direct funding for public R&D should be concentrated through institutions where spill-over effects to the wider economy are maximised.

Targeted enterprise policy with special attention to high growth firms

- Enterprise policy should be clearly focused on high growth firms, with particular attention to removing barriers to growth for smaller HGFs;
 - The regional employment premium is wasteful and ineffective and should be phased out with the cash transferred to LEPs;
- Local business services should be refocused away from across the board general support to a more selective and faster response responsive to faster growing firms.

Supporting the low carbon economy through centralised funding a commitment to future investment

- Establishment of a vision for the development of the UK's low carbon infrastructure including support for large scale private investment;
- A cross cutting audit of current spending followed by a single point of contact for businesses and a single low carbon economy fund, linked to the long-term ambitions of the Climate Change Act;
- Stronger signals on the future costs of emitting carbon dioxide to support the development of demand for all low carbon economy activities.

- **A new approach to urban policy must be developed and aimed at developing a more balanced knowledge based economy within the regions of the UK.**

- Venture capital must be strengthened in public sector dependent regions – and particularly less successful cities;
- Maximise the public sector in less successful cities and ensure anchor institutions are linked to LEPs;
- Remove barriers to movement from less successful cities – but consider the implications for those left behind;
- Make connections between successful and less successful cities. Ensure labour market policies are locally appropriate. Recognise that sustainable growth is about building up and not circulating talent;
- Ensure Local Enterprise Partnerships have clarity of purpose, strategies and powers and that that weak cities do not have weak Local Enterprise Partnerships;
- Create local innovation panels – integrated into the LEPs.

Section 7

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