



REPORT OF THE

# Future of Work Commission





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**‘Britain isn’t prepared for the technological revolution. We must act now.’**

*Tom Watson MP,  
Co-Chair*

**‘We need to master the new technological revolution to create a revolution in good work.’**

*Helen Mountfield QC,  
Co-Chair*

## FOREWORD

Work, and our experience of work, shapes our society and our nation. Work is at the centre of people’s lives, communities and the economy. When it changes, we change too.

And the world of work *is* changing – fast. ***The single most important driver of this change is the new technological revolution.***<sup>1</sup>

The impact of technological innovation can also be seen across a range of current social and economic trends: real wages are falling, inequality is rising, and productivity growth is slowing. These trends characterise the daily experience of millions of working people.

This is what the Future of Work Commission, which I convened and co-chaired alongside Helen Mountfield QC, has explored over the past year: The future of work in Britain in the context of the technological revolution.

We need to face the most pressing challenges and opportunities of the technological revolution in ways that will spread new benefits to every citizen and accelerate transition for the common good. Innovation and social justice should advance together.<sup>2</sup>

Britain is unprepared for the technological revolution. Our research, and that undertaken by individual Commissioners, supports this view. We think this revolution will be at least as great as anything we have seen in the past. The accessibility of technology, the breadth of its applications and the use of huge new data-sets may well increase the pace of change further. This demands strategic planning: the policy choices we make now will shape how technological change continues to affect the work and lives of our citizens.

We need a sharper and more consistent focus on work that will harness new opportunities and share the benefits of the technological revolution for the common good. Work provides us with an income: wages are the single most important determinant of our living standards. And it is our jobs that connect the living standards of individuals, households and families with the economic growth of our nation. But the work-wage bargain is more than a by-product of the pursuit of profit. Good work sustains us as individuals and binds us as a society.

To take full advantage of technological change – to increase and spread its benefits and shape a future which is both prosperous and fair – we need to create, value and sustain good, fairly-paid work for our citizens into the future. This is the best way to champion the British entrepreneurial spirit and buck some of the most troublesome trends we currently face.

This goal should be placed at the heart of our policy and political thinking. Doing so will empower people and put citizens at the centre of action. It will contribute to our sense of civic identity and citizenship. And measuring good work will give us a measure of our progress, as a society, through the age of technology. This Commission wants Britain to take pride in building a future of good work. We must start now.

**Tom Watson MP**

Deputy Leader of the Labour Party

Convener and Co-Chair, Future of Work Commission

<sup>1</sup> We define ‘technology’ broadly, to include robotics, artificial intelligence (AI) and machine learning (ML), the internet, big data analysis, the internet of things, digital technologies; combining and applying these technologies in diverse ways; and also to the collection of techniques, skills, processes and knowledge used by humans in relation to these technologies.

<sup>2</sup> Our Terms of Reference are set out in Annex 1

**'Technological progress is transforming our economy, with significant consequences for pay, security and quality of work. The need to act is urgent.'**

*Daniel Susskind,  
Commissioner*

**'Co-operation is a model with a proven track record. It is working around the world.'**

*Claire McCarthy,  
Commissioner*

**'The best way to generate and spread the benefits of technological innovation is to create good, fairly paid work for our citizens.'**

*Naomi Climer,  
Commissioner*

## **INTRODUCTION**

### **THIS REPORT**

This report starts from first principles. Chapter 1 explores the meaning of work. It sets out the foundational principles which define our vision of what good work is, and describes how we can measure our progress towards it.

Chapter 2 explores how technology is already transforming work, and the world in which the principles set out in Chapter 1 must be applied to realise our vision of a future of good, fairly paid work as the technological revolution unfolds. It identifies the social and economic challenges we must confront and new opportunities for job creation – to increase productivity and make work better.

This points to a radical rethink of our social, economic and cultural institutions to manage transition and meet new challenges. The problems of inequality and job insecurity are not new. But the solutions will need to be.

Chapter 3 sets out our recommendations. We explore new priorities and new institutions, new rights and new responsibilities. We set out the first steps that can be taken to achieve the social and economic conditions which will spread the benefits of technological change and secure a future of good, fairly-paid work available equally to every citizen.

One theme runs through this report: co-operation. To harness the opportunities of technological innovation and manage transition in the best possible way, we must rediscover what it means to build a society based on co-operation: one that benefits everyone. Growth, innovation, and good work, are built together. Missions are fulfilled, and practical solutions built, together. The technological revolution demands that we work together for our common good, combining our strengths, and seeing our institutions not just as agents of competition, but of co-operation too.

Only together can we build a fair, dynamic economy for the common good – creating good, fairly paid work through the technological revolution for the many, not the few.



## WHO WE ARE

The independent Future of Work Commission was convened by Tom Watson MP, Deputy Leader of the Labour Party, in September 2016. It is co-chaired by Helen Mountfield QC. This report aims to support policy development. It is independent of the Labour Party and does not represent Labour Party policy. Individual Commissioners are not responsible for specific facts or recommendations.

The Commission's terms of reference and a list of Commissioners are set out in Annex 1.

## WHAT WE HAVE DONE

This year the Commission has:

- Developed research with Commission economists, machine learning analysts and political philosophers
- Undertaken new survey research coordinated by the trade union USDAW
- Called and considered evidence from the public and stakeholders across Britain
- Hosted three public evidence sessions
- Collaborated with InnovationRCA, which has hosted an innovation challenge for students and start-ups: Our Place in the World: The Future of Work
- Commissioned a YouGov poll
- Participated in workshops, design-thinking, conferences and roundtables, including those hosted by the TUC, Leicester Centre for Sustainable Work and Employment, and Chatham House
- Joined a public dialogue with our commissioner Michael Sandel at a school in Dagenham aired by the BBC: Would Life Be Better if Robots Did All The Work?
- Analysed evidence obtained by the Science and Technology, Work and Pensions and BEIS Committees, and all other published material relevant to our mission.

In addition, many of our Commissioners have independently undertaken work which is relevant to our terms of reference, some of which is ongoing, and which has informed the Commission's recommendations. We are grateful to the Commissioners for sharing their work, and to their researchers and institutions for significant support this year.

The Commission will continue a dialogue with stakeholders and consult widely on their mission, guiding principles, first recommendations and implementation during through the second phase of work.





## EXECUTIVE SUMMARY

**Work is more than simply a factor in the process of production,** like capital or land. It isn't just something people do in between leisure, family life and sleep, or just to pay the bills. Good work is part of people's identities. It enriches our lives, and enables us to be fuller and better citizens. It reminds us that we – as individuals, communities, and a society – build our own future.

That means that questions about the future of work – questions about how work is changing – are political questions as well as economic ones. Changes to work cannot be left for market forces alone to shape, or thought of purely as business decisions. They affect all of us. And the governments we elect have a responsibility to make sure that the work and lives of the citizens they represent are enhanced, rather than diminished, by technological innovation.

**The technological revolution is behind some of the most challenging social and economic trends which bear on work in Britain.** These trends describe reality *now* for many people across the UK: falling real wages, increasing inequality and the growth of a vulnerable workforce. These are not the inevitable consequences of technological change, but of the failure of governments to face up to this responsibility.

New technology has vast potential to change the work and lives of all our citizens for the better. A sharper and more consistent focus on good work is the best way to generate and spread the benefits of technological innovation and build a genuinely inclusive economy. ***Now, more than ever, this is a moral, social and economic imperative.***

At present, productivity is falling and the benefits of technological innovation are not fairly shared. We need bold, integrated and consistent policy action to grasp opportunities, buck trends, and avoid pitfalls. We need to shape the industries of the future and create good, fairly-paid work for our citizens. ***We can be optimistic about the future of work in Britain, but we must act now.***

## OUR PRINCIPLES

What is good work, and why does it matter? This report begins from first principles, derived from evidence and public dialogue we have considered. We need to recognise and value these principles to protect key aspects of good work into the future. Knowing what good work means is especially important through a period of transition.

We believe that:

- Work is **valuable in itself**
- Work should provide **dignity**
- Work should offer **security**
- Work should promote **autonomy**
- Good work should be **available to everyone**



**Work is valuable in itself** – and not just as a source of income. Work is part of our identities as individuals and communities, our sense of purpose, and one of the most important means by which citizens contribute to our collective life. Work matters.

**Work should provide dignity** – we must pay more attention to the respect, as well as the income, workers receive for their jobs. Our research suggests that dignity and fulfilment in the British workplace is decreasing. The value of many workers whose jobs are essential to the functioning of our society is not sufficiently recognised.

**Work should offer security** – so that workers can depend on a fair and predictable income, and are not exploited or forced to assume a burden of risks they cannot bear. The evidence we have examined suggests that new patterns of work and business have tipped the balance of the labour market towards insecurity, and the balance of risk towards workers.

**Work should promote autonomy** – workers must be able to make choices about their work and their futures, to exercise creativity and judgement. Workers are not robots; people work best when they can choose how to fulfil their potential, and have an effective voice in the workplace. A flexible labour market should offer autonomy to working people, as well as to employers.

**Good work should be available to everyone** – not the preserve of a small proportion of higher-income earners, and not limited by social and economic circumstances, gender, race, or disability. Not everyone is able to work or needs the same kind of work, but good quality work should be accessible to every citizen.

## THE TRENDS

Innovations in digitisation, computing, artificial intelligence (AI) and robotics lie behind many wider transformations in our economy and labour market which we are already experiencing. We think that both the scope and pace of the current technological revolution are likely to be *at least* as great as any that has gone before.

*First, recent advances make it possible to automate a much greater range of tasks* than those enabled by previous developments. This means that the current wave of automation will reach into sections of our economy that have traditionally been considered “safe”, including jobs which involve complex cognitive or analytic tasks. *New technologies are increasingly capable and pervasive.*

*Second, the pace of technological advance has increased*, and the fusion of new technologies – in particular, recent developments in *machine learning combined with the data explosion* – may make change faster than before.

Making accurate predictions about the speed and extent of automation is not easy. Our research suggests that the impacts and risks of technological change are not widely understood, and that workers and employees hold different views about the likelihood and pace of automation in particular spheres. Automation will undoubtedly affect

**'We must build a future where technology is used to enhance workers, not replace them.'**

*John Evans,  
Commissioner*

different sectors and regions in very different ways. Nevertheless, we have identified the following trends in the UK labour market:

**Labour market polarisation, driven by the automation of routine tasks, is likely to reduce.** Routine tasks have traditionally been more vulnerable to automation than non-routine ones, which do not follow rules that can be explicitly stated and followed. But as artificial intelligence develops, the automation of non-routine analytical tasks is likely to increase. *Tasks that are less vulnerable to automation involve our most human qualities: creativity, care, teamwork, critical-thinking and imagination.*

**Without policy intervention, the power of the high-skilled over the low-skilled will increase further.** Technological change is likely to both raise the productivity of high-skill workers and increase competition for low-skill jobs which are not susceptible to automation. Low-skill workers, who make up 45 percent of the labour market, are particularly vulnerable. Without intervention, low skilled workers are at risk of a severe and sustained decline in their wages. *Workers at risk of displacement need a new education and skills system which focuses on lifelong learning and offers extensive opportunities to retrain.*

**The average working week is likely to reduce.** The average working week in the UK has fallen from about 50 hours per week in 1900 to just above 30 hours today. In the future, in spite of this year's flat trend in average hours, we can expect average working hours to decline further. People who work fewer hours tend to be more productive; as working time increases, average output per hour decreases. *We should aspire to a labour market which offers more leisure time, and still offers good work to everyone.*

**But mass technological unemployment is highly unlikely.** There is no substantive evidence that Britain is heading towards widespread technological unemployment, exaggeration is unhelpful. We need a more nuanced debate about the impact and potential of automation – one that recognises that technological change is already having social and economic effects. The main problem we face is not the number or availability of jobs but their productivity and quality. *We must focus on how best to increase levels of human and capital investment, spread the benefits of technological innovation, and create good work.*

**New patterns of work have become more common.** "Atypical workers" – those not on standard employment contracts – now account for a significant proportion of the UK workforce, with 5 million self-employed workers, 900,000 workers on zero-hours contracts, and 800,000 agency workers. Recent research suggests the pattern of increasing atypical work may be slowing. But the size of this vulnerable workforce hasn't diminished. *We must ensure our legal framework does not favour atypical work, to ensure these new forms of work are good jobs, rather than a last resort to avoid unemployment. And new forms of working may need new forms of collective voice, alongside traditional ones, to rebalance labour relations in Britain.*

**Britain is becoming more entrepreneurial** but is held back by low levels of public and private investment. Early stage enterprise is not translating into sustained growth or higher levels of good work.

**'Britain is becoming more entrepreneurial and the opportunities for innovation growth pathways are vast. We must seize them.'**

*Naomi Climer,  
Commissioner*

Britain's early enterprise rate is particularly strong in tech-related industries including AI, data analytics and robotics. Four out of five of the world's biggest AI start-up acquisitions over the last five years involved purchases of UK start-ups by global corporates, meaning that the gains do not continue to flow into the British economy. We need to encourage tech start-ups to become expanding businesses based in the UK: we would like to see a British 'Apple'. *If we address our 'scale-up gap', then our growth levels – and the potential to create good work – would dramatically increase.*

**Productivity growth is slowing and decoupling from wage growth.**

For the past 20 years, productivity growth has been driven by a small number of sectors and firms. Productivity is the cornerstone of the UK's future GDP growth – and Britain is sinking to the bottom of G7 growth table.<sup>3</sup> In line with this, the Office for Budget Responsibility has cut its growth and productivity forecasts sharply.<sup>4</sup> Just as serious is the more recent trend for wages to grow more slowly than productivity – or not at all. This means that where productivity has risen, there has not been a commensurate rise in wages.

Technological innovation, application and best practice have not dispersed to the long tail of low productivity firms in Britain. *We must support investment in new technologies across the country to address Britain's productivity crisis and low-wage model. As we harness new opportunities, we must make sure that wages rise with gains in productivity.* This feeds into our next observation.

**Labour's share is declining and inequality is increasing.** The share of national income returned to labour rather than to capital has declined over recent decades in most OECD countries, including the UK. This means that the differential between money made by owning things and money made by working is growing. And since capital is distributed more unevenly than wages, a rising share of income to capital has meant increasing inequality. The Financial Conduct Authority recently found that 25.6 million people in the UK are 'financially vulnerable'.<sup>5</sup>

We think that the technological revolution is the most significant driver of these trends, accounting for about half the decline in labour's share.<sup>6</sup> Without a robust policy response, inequality will increase further. *We must ensure that the profits from technological progress do not accrue only to those that own and control the capital. Generating good, fairly paid work for everyone is the best way to address this trend.* Good work is work that gives a fair return to workers.

These trends are playing out differently in different sectors and regions. The pace and nature of change will affect all British sectors – but at different rates. Some industries will change faster and diminish in size in the short term – for example, the traditional transport, retail and administration industries. Others will grow – for instance, care and social work. Some will simply change, like health. At the same time, new jobs and some entirely new industries will emerge, such as electric and automated modes of transport. Regional analysis suggests that areas which have already been hit by industrial decline now host sectors most vulnerable to automation – and so may be hit twice.

<sup>3</sup> OECD growth forecast November 2017 accessed 4 December 2017. <http://www.oecd.org/eco/outlook/economic-outlook/>. OECD forecasts a drop in growth from 1.5% to 1.2% in 2018 which would put the UK at the bottom of the growth table.

<sup>4</sup> The Office for Budget Responsibility cut its growth forecast for the UK economy sharply in November 2017, following changes to estimates of productivity. It now expects the economy to grow by 1.5%, down from its previous forecast of 2%

<sup>5</sup> 4.1 million, mostly between the ages of 25 to 34, were considered to be in 'serious financial difficulty'. The FCA pointed towards a growing 'wealth gap' in British society driving people, especially the young, towards consumer credit. FCA, *Understanding the financial lives of UK adults: Findings from the FCA's Financial Lives Survey 2017*, October 2017

<sup>6</sup> Weicheng Lian, Mai Chi Dao, and Zsoka Koczan, "Drivers of Declining Labor Share of Income," IMF, (2017)



## OUR RECOMMENDATIONS

Our policy recommendations aim to turn our guiding, foundational principles of good work into reality, in light of the trends identified by our research. They are ambitious in their scope and scale. They touch on a broad spectrum of domains that relate to work, wages and the workplace. This is because we believe that to implement our principles in the age of technology, to survive new challenges, maximize opportunity and generate good work for everyone, our economic, social and cultural institutions must change.

We have grouped our recommendations into 6 main areas:

- **Prioritising Good Work**
- **Skills for the Future**
- **Promoting Innovation**
- **New Models: Corporate Governance and Alternative Ownership**
- **Labour Rights and Standards**
- **Ethics**

### AREA 1: PRIORITISING GOOD WORK

Because work is central to our lives, families and communities, as well as to the economy, we believe the creation of good work should be at the heart of Britain's public policy agenda, guiding policymaking across government. Public policy should have a new, clearly stated, and simple ambition: to create the social and economic conditions which generate and protect good work in the age of technology.


- To ensure this remains at the heart of national policy development and encourage fresh thinking about how to achieve this goal through the technological revolution, we recommend a new **Charter for Good Work**. This national organising framework would identify the government's commitment to building a future of good work as a central objective of its social and macroeconomic policy, define the components of good work, and set out how those components should be protected. The Charter for Good Work is particularly important because of the uncertainty of individually enforceable workers' rights derived from EU law and the future of the British Human Rights Act. It supports both, and does not substitute for either.
- We recommend the creation of a **Futures Unit** in Whitehall which cuts across departments at Director-General level. The Futures Unit would be headed by a **Chief Futures Officer** and ensure that across all areas, government is abreast of the latest technological developments, builds constructive partnerships with business leaders and academics, responds with more agility to new challenges, and pilots innovative applications across government. Alongside the unit, a Futures Service should be established to train fast-stream civil servants in AI and related technologies.
- Government should initiate the **British equivalent of the German White Paper on the future of work, "Work 4.0"**<sup>7</sup> to consider and devise a comprehensive national strategy for our future of work in the age of technology, jointly with partners.

<sup>7</sup> <http://www.bmas.de/EN/Services/Publications/a883-white-paper.html>



- We recommend that all public sector bodies should have a duty to report regularly on **technology/AI strategy**. The current approach to AI in the public sector is haphazard. A duty to consider and report on the use of technology to improve public work and services would focus attention on new opportunities and challenges.
- We recommend the use of public procurement to support good work. The Futures Unit should devise **guidance on the intelligent use of technology** to encourage public sector departments and bodies to consider the use of technology and potential for improvement when procuring goods and services.
- We think that there is merit in exploring options for a **new mandate for the Bank of England** – in particular, to consider extending the remit of the mandate so that the Bank can target inflation, employment and growth as primary objectives. This would allow the Bank to carry out a balancing exercise between inflation, growth and employment; and to consider the availability and cost of credit to buy technology to generate growth and good work. We recommend an open, public debate on updating the Bank’s mandate.
- Government should explore **new types of direct investment** to boost collaboration with the private sector and share risk-taking as part of the innovation ecosystem. This should extend to consideration of ways in which the state may take royalties, revenues, equity or other benefits from their investments. The Chief Futures Officer should advise the government on direct investment.
- The **Equality Act 2010 should be extended** to allow a right to understand the basis for algorithmic decision-making and to prohibit discrimination by algorithms. New technology should be applied to **promote and monitor equality in the workplace**, including **uniform pay gap reporting**, support for girls and women learning STEAM<sup>8</sup> subjects, and improving job-seeking services for disadvantaged groups. Promoting equality more effectively in the workplace is an important aspect of making sure that good work is available to everyone
- We recommend **expanding the remit of the Office of National Statistics and National Audit Office** to gather and assess the impact of changing working patterns and job quality. The **OECD’s job quality index** should be used and improved to measure our progress towards a future of good work. Government, working with business and trade unions, should develop new measures and tools to understand, predict and respond to change better.
- Alongside these recommendations, we need a **review of the UK approach to capital taxation** with proper consideration of changing returns to capital and labour, and of how the capital tax system could better ensure that productivity gains do not accrue exclusively to those who own or control the capital through the age of technology. The review should include how best to **use the tax code** to restore the relationship between wage increases and productivity gains. There is a tendency towards consolidation in the technology sector, and this is driven by large companies involved in aggressive **tax avoidance**. So specific intervention may be required to ensure

<sup>8</sup> We use ‘STEAM’ to mean ‘STEM’ subjects (Science, Technology, Engineering and Maths) plus arts subjects.



these companies take a fair share of the effective tax burden. This could pay for new policies aimed at managing disruption and improving access to good work for everyone.

### **Draft Charter for Good Work**

Public policy should aim to achieve the social and economic conditions in which the following principles are effectively realised, to protect the basic components of good work:

- 1) Everyone should have an equal opportunity to earn their living in an occupation into which they enter freely and without discrimination.
- 2) All workers should receive fair remuneration.
- 3) All workers should have working conditions that respect their dignity.
- 4) All workers should have working conditions that respect their autonomy.
- 5) All workers should have safe working conditions which protect physical and mental wellbeing.
- 6) All workers should have an effective and enforceable right to freedom of association.
- 7) All workers should have access to organisations which represent their interests and to institutions which enable them to exercise their rights and enjoy social protection at work.
- 8) Everyone should have facilities for vocational training.
- 9) All workers should have the opportunity to participate in improving their working conditions.
- 10) Everyone should have the right to protection, control and use of their personal data.



## AREA 2: SKILLS FOR THE FUTURE

The skills which our labour market demands are changing and will continue to change at ever-increasing speeds. Workers at all skill levels will need to retrain with greater frequency than ever before. We will need future-proof, transferable human skills nurtured from the classroom to ensure that new opportunities are equally accessible, and nobody is left behind. That means schools should prioritise creativity and interpersonal skills alongside digital and tech-related skills, and that lifelong learning is available to everyone. We think that human creativity lies at the heart of the work of the future and a fulfilling work life.

- We recommend that the content of the **school curriculum be changed**, to ensure our approach to education is oriented towards the future, with human creativity at its centre. There should be a **'preparedness for work' objective** in the national curriculum, to ensure that creative subjects feature alongside computer science and data literacies as core competences.
- We should **pilot innovative use of AI technologies in the classroom** to assist teachers in providing more creative, individualised learning programmes, and to explore alternatives to the traditional format of exams.
- A specific **AI curriculum** should be developed in secondary schools, alongside AI-focused vocational, conversion, graduate and post-graduate courses. We think **ethics training** should always be part of AI training.
- We recommend that government should establish a **universal lifelong learning Future Skills account** to enable individuals to learn, re-skill and develop new careers over a lifetime. Government, individuals and businesses should develop and support this account together, in different ways, agreed to reflect changing labour market demands. Existing and new sectoral councils should advise on industry skills needed, anticipated and shortfalls to inform priorities for the Future Skills accounts and reduce skills mismatch.
- We recommend establishing **technical learning trusts** to link the tiers of technical education around a future skills lead, connecting universities, FE colleges, institutes of technical excellence and academy trusts. Local SMEs could be involved in governance and in advisory roles. This framework would help co-ordinate Future Skills programmes, share best practice, and apply research.
- We recommend a **review and reform of the sanctions regime for job-seekers** to avoid unjust sanctions which contribute to downward pressure on wages in some sectors, and discouraging re-skilling. Jobcentres should be given specific additional remits to help support new self-employed workers and part-time workers, and to propose changes to career paths.





### AREA 3: PROMOTING INNOVATION

The pace and scope of technological change is increasing, but the pace of productivity growth in the UK has so far remained sluggish. Our evidence suggests that the single biggest problem for growth, and the potential to create good work, is a low level of public and private investment in physical and human capital. This failure is particularly acute with regard to support for investment in new technologies, and in the new technology sectors themselves. In the context of Brexit, Britain risks losing the support of EU R&D and innovation programmes and funds, such as Horizon 2020. We cannot afford to reduce investment which promotes innovation: investment must increase, not decrease. We support the development of integrated, long-term innovation pathways which link skills and R&D spend, regional and national industrial strategies.

- We need a higher **dedicated technology R&D budget set at a fixed percentage of GDP**, to encourage not only the UK's world-class research but also the development of applications to support longer-term growth. This should be part of focusing an increased R&D and innovation spend (in the form of both public grants and incentives for private-sector R&D spending) to the OECD average of 3.5 percent of our GDP by 2030.
- **Tax and business rates regimes should be reformed to incentivise business to invest more in new technologies.** The current scheme is both inadequate and outdated. For example, it does not apply to leasing servers in the cloud, although incentivising cloud-based investment could transform productivity. Some incentives could be enhanced or conditional on the introduction of profit-sharing schemes.
- We recommend policies to **raise the wage floor in Britain.** Government should aim to increase jobs paid above the floor National Living Wage level in the public sector and offer incentives to business to do the same. We support the introduction of joint liabilities for payment of the National Living Wage down supply chains, and stronger penalties for non-compliance. The remit and support for the Director of Labour Market Enforcement should be increased. The public sector pay cap should be lifted. These measures should increase innovation, as well as fair remuneration.
- We recommend adopting a more **accommodating regulatory environment** for experimentation with AI and related technologies on a trial basis, so that the UK is well placed to compete internationally in establishing technology clusters. We recognise the merit in supporting first-mover advantage, although we support a standing Commission to advise on ethics and regulation beyond trial phase.
- We recommend policies to encourage closer R&D **collaboration** between universities, tiers of technical education and business by requiring applicants for R&D grants to demonstrate some consideration of the commercial context. This will increase the prospect of successful scale-up.



- Local government, business, academia and other partners should develop **place-based innovation strategies** for granular, more targeted local policies to encourage growth and the future of good work in local communities. These should be integrated into a mission-orientated national **Industrial Strategy** focusing on national growth areas but addressing the **needs of all sectors**, including those most vulnerable to automation.
- Innovation and productivity are closely linked. We recommend **sectoral productivity councils** aimed at encouraging innovation and the diffusion of new technologies through sectors to the long-tail of low productivity firms. The councils would strengthen cooperation between stakeholders including representatives from business, government, academia and trade unions. They should aim at increasing innovation, productivity and wages together.
- The size and scope of national innovation challenges should be increased significantly, starting with an expansion of Innovate UK's initiative of a Robotics and AI **Industrial Strategy Challenge Fund**.<sup>9</sup>
- We should adopt clearer national guidance and **standards for Open Data** so that uncontroversial public data sets are made more readily accessible and frameworks are developed to govern how restricted users might use more sensitive data without compromising privacy.
- We recommend an independent **review of the application, adequacy and enforcement of competition law principles** in innovation and digital markets. Competition drives innovation. We must make sure that competition law keeps pace with the technological revolution.

#### **AREA 4: NEW MODELS, CORPORATE GOVERNANCE AND ALTERNATIVE OWNERSHIP**

Good business models make for good work. To cope with transition and the integration of new technologies into businesses, Britain's framework for corporate governance will need to encourage higher levels of stakeholder participation and the development of future-orientated business strategies. In particular, workers can help businesses adopt and integrate new technologies to make the most of their productivity-boosting potential.

There is good evidence that alternative models of ownership can drive innovation and long-term, sustainable growth, as well as worker participation. Alternative ownership, especially the development of co-operatively owned businesses, is growing, buoyed by demand for a fairer economy. But support is needed for further growth. Our recommendations aim to support a more resilient, productive and entrepreneurial economy, and promote best practice, through the technological revolution.

- We recommend a **new duty on companies to 'involve' stakeholders, which must include workers**. This duty will ensure that all genuine stakeholders are able to have a say in growth strategies realise the goal of meaningful participation in companies' strategic and operational decision-making, especially regarding

<sup>9</sup> Innovate UK is the UK's innovation agency, an executive non-departmental body sponsored by the Department for Business, Energy and Industrial Strategy



the adoption and integration of new technology. It will encourage investors and workers to apply technology in way that will support our common goals of long-term, sustainable investment in growth and good work.

- Section 172 of the Companies Act 2006 should be reformed so that Directors of public limited companies have statutory **duties to the long-term stewardship** of the company and **consider the interests of all stakeholders**.
- We recommend policies to **support diverse forms of business ownership**. These should include support to publicise and expand different types of employee ownership, government guarantees for buy-outs on the sale of businesses and facilitating access to finance. We should encourage piloting new forms of profit-sharing and ownership in the digital space, for example taxi platform co-operatives.
- **Support for British co-operatives and mutuals** could include improving access to long-term finance, peer-to-peer lending guarantees, enhancing and publicising tax exemptions, and increasing representation in local and national decision-making.
- Statistics mapping alternative ownership, especially employee cooperatives, should be obtained with a view to **annual reports to the BEIS and Treasury Committees** on growth of alternative ownership models.
- We recommend a new **private sector equality duty**, based on the successful public sector equality duty under the Equalities Act, requiring large employers to have 'due regard' to the impact of their decisions on protected groups. This will help ensure diverse representation on Boards and spread new profits.
- There should be **stronger reporting requirements** for companies to cover ownership and workforce contract types, pay, pay ratios, pay gaps, benefits and staff turnover.

## **AREA 5: LABOUR RIGHTS AND STANDARDS**

Patterns of work are changing, including the growth of 'atypical' work and reduced working hours, alongside the broader challenge of growing income inequality, and a growing imbalance of control, risk and income in the labour market.

We need a simple, new, future-proof legal framework, a wider application of existing employee protections, and some additional rights in response to specific challenges related to the technological revolution. We think these rights are needed to apply our foundational principles and Charter through the age of technology. Overall, an intelligent and fairly regulated labour market aimed at supporting a dynamic and flexible national workforce will increase innovation, productivity, resilience – and the components of good work too.

- We recommend **working towards just one category of 'worker'** for enjoying employment protection in UK law. Whether a person is an employee, an agency worker or a contractor should make



no difference to their employment rights. The benefits enjoyed by employees should be enjoyed by all economically dependent workers. We also recommend an incremental increase of basics rights for the genuinely self-employed, including sick and holiday pay and shared parental leave as part of a **new deal for the self-employed**.

- We recommend developing a package of **additional individually enforceable labour rights** to protect fundamental components of the principles and social rights set out in the Charter to offer security and dignity to all remunerated workers in the age of technology. They include working towards new rights including a **freestanding right not be subject to significant decisions based solely on automated processing and a right to algorithmic fairness; and to flexible working and to leave for learning for those working for large employers**. Existing rights to consultation, statutory redundancy and data protection should also be updated.
- We must provide support for **new and emerging forms of worker organisation** - not just those based on the traditional employment model - to represent workers' interest and strengthen the collective voice. We suggest starting with practical support for new models of association and organisations for freelance workers as alternatives to reliance on agencies and platforms.
- We support the formation of a **new representative body for entrepreneurs**. Large technology companies have a strong voice in Whitehall. SMEs, start-ups and entrepreneurs do not. A representative body for entrepreneurs in the UK would give them stronger representation and provide a useful single point of call for interactions with government.
- We should explore new ways to increase trade unions' access to members. This could include **digital, as well as physical, access** to potential members; the use of virtual, as well as physical, communal spaces; new types of membership; new packages relevant to the self-employed such as access to insurance or payment collection; and exploring **virtual or e-unions and branches**.
- **Trade unions should be supported in developing new roles** to ensure that transition is managed in an efficient and socially just manner – for example, by initiating technology agreements aimed at the cooperative introduction of new technology, and by gathering advanced sector-specific data to inform the process.



## AREA 6: ETHICS AND THE NEW TECHNOLOGICAL REVOLUTION

Thinking about ethics gives us a picture of the broadest implications of technology on society, helps us understand and respond holistically to concerns about its introduction, and enables us to change the culture and best practice of our institutions. On a more practical note, understanding the ethical implications of technology is necessary to support innovation and inform regulatory change. We welcome recent corporate initiatives to consider the responsible development of AI. But ethics and advice on regulation cannot be privatised; government must play a leading role and make sure that the public and all stakeholders are involved.

- We recommend an independent cross-disciplinary **Standing Commission on Ethics and Technology**, which would tackle the toughest ethical and societal implication of new technology and prepare the groundwork for regulation. If pressing ethical issues are not tackled, innovation will be unnecessarily hampered. The remit of the Commission should extend to guidance on **promoting equality, training, regulation, trials, best practice and algorithmic accountability**.
- We recommend **ethics training** as a requirement for those involved in the production process of machine learning technology.
- Workers are also consumers, carers, tax-payers, and recipients of welfare. The increasing use of new data sets and analytics in new business models demands an informed debate on the **ethics, value and exploitation of data**. This debate should cover the use, ownership and protection of personal data in the workplace. We suggest the first step is to require some level of transparency and disclosure about data and algorithm use. Government, working with partners, can then explore ways to shift control of data to people.
- Responsible conduct by corporations beyond strict legal requirements should be encouraged with an emphasis on **leadership in corporate sustainability**, as well as through tax and business rate incentives. Ethically run corporations will volunteer high levels of transparency and accountability, including in the use of algorithms and data analytics. They will pioneer and pilot schemes to create and measure good work, share the benefits of new technology, promote diversity and involve workers in strategic and operational decision-making through transition.
- We recommend developing **kite marks and standards** for old and new business models including online platforms which encourage 'good' and better work practices and adoption of the Good Work Charter. This will enable informed public choice. Responsible conduct should be good for business.





## CHAPTER 1: LAYING THE FOUNDATIONS

This chapter explains the principles which form the foundations for our report, and our policy recommendations in Chapter 3.

Chapter 1 sets out our guiding principles. The principles we have identified are the fundamental aspects of good work. These principles are derived from the evidence we have gathered about what people want from their work. They should be refined and deepened through in-depth consultation.<sup>10</sup>

The principles, which inform our understanding of ‘good work’ are:

- Work is **valuable in itself**
- Work should provide **dignity**
- Work should offer **security**
- Work should promote **autonomy**
- Good work should be **available to everyone**

### WHAT IS GOOD WORK?

Work that reflects these principles is ‘good work’. Bad work is bad for health, self-respect and well-being.<sup>11</sup> It is also bad for productivity.<sup>12</sup> Good work offers a sense of meaning and purpose; it respects people’s dignity, offering workers autonomy and the chance to progress. Good work enhances people’s social, community and family relationships; it does not compete with them.

These principles reflect our perspective that work is more than simply a factor in the process of production, like capital or land. Good work enriches our lives, enabling us to be fuller and better citizens, and reminds us that as a society, we all contribute to and share a common economic fate.

<sup>10</sup> We have begun our research in this area by (i) working with USDAW to commission a large survey, the result of which are presented below, and which is presented in Annex 1; (ii) by participating in a public conference, hosted by Michael Sandel, a member of the Commission, on the meaning of work in a technological age, in February 2017. We will use our survey methodology, and gather further qualitative evidence, to test, refine and deepen the principles we identify in this interim report.

<sup>11</sup> NEF, “Wellbeing at Work: A Review of the Literature” (New Economics Foundation, 2014), <http://neweconomics.org/2014/03/wellbeing-at-work/>.

<sup>12</sup> Vicente Royuela and Jordi Suriñach, “Quality of Work and Aggregate Productivity,” *Social Indicators Research* 113, no. 1 (2013): 37–66.

**“Once you get guys into a job and find their strengths – everyone has them – you see a blossoming that is hard to describe”.**

*Chris Rawlins,  
Founder of SoFab  
Sports*

## THE COMMISSION'S PRINCIPLES

### Work is valuable in itself

The way people think about work is often contradictory. On the one hand, we view work as a means to an end: a way of earning money to live and do other things; a necessary evil; a distraction from family and social life. On the other hand, work is part of our individual and collective identities. On it, we rest our ambitions and aspirations for the future. We believe that what we do is a large part of who we are.

This Commission believes that work matters for its own sake as well as for its financial rewards. Working people value their jobs and believe that work plays an important role in their lives. Work is one of the most important means by which citizens contribute to our collective life. Through it, we produce things and provide services that others value, demonstrating our commitment to one another and to our common project of building a fair and prosperous future. The income received from work allows people to make independent choices about the course of their lives. Work itself shapes the identities of individuals and communities. It is part of what affirms their sense of worth and their place in society.

This is why so much of the recent literature about the future of work – which is essentially about a future without work – seems so detached from everyday lives and the essence of humanity.<sup>13</sup>

Do we want to live in a society without work? There are good reasons to think that we do not. According to the latest British Social Attitudes survey, 62 percent of respondents said they would enjoy having a job even if they did not need the money.<sup>14</sup> Future of Work Commission member Michael Sandel held a public dialogue in Dagenham in March 2017 which clearly suggested the same.<sup>15</sup> As we explain in Part 2, an economy without work is not actually on the cards. For these reasons, this Commission's principles support and endeavour to improve work; they do not abandon it.

This does not mean that work will not or should not change. We should embrace the fact that technology is likely to reduce the need for people to perform dull and repetitive tasks. We should welcome the possibility of a world in which there is more time for people to spend with their families and on valuable social activity which is not paid. But we must recognise the economic, psychological and social cost of the dislocation of workers, and take steps to enable people to find fulfilling work in other fields. In the twenty-first century, we should seek to enable people to perform 'good work' – work that enables them to be creative and express themselves; work that encourages people to form connections with one another rather than isolating them; and work that offers security as well as choice.<sup>16</sup>

<sup>13</sup> Nick Srnicek, *Inventing the Future: Postcapitalism and a World without Work* (Brooklyn, NY: Verso Books, 2015); Martin R. Ford, *Rise of the Robots: Technology and the Threat of a Jobless Future* (New York, NY: Basic Books, 2015).

<sup>14</sup> Stephen McKay and Ian Simpson, *British Social Attitudes 33: Work, 2015* <http://www.bsa.natcen.ac.uk/latest-report/british-social-attitudes-33/work.aspx?ga=2.126049221.979363213.1496086505-1182330380.1496086505>.

<sup>15</sup> *Would life be better if robots did all the work*, *The Public Philosopher* series, BBC, Tue 7 Mar 2017. <http://www.bbc.co.uk/programmes/b08gxndc>

<sup>16</sup> *Work 4.0, "White Paper, Work 4.0: Re-Imagining Work," White Paper (Federal Ministry of Labour and Social Affairs, Government of Germany, 2017).*



**“The discussion we’ve had [gives me] the impression that future of work debates are about more than pay and economics [...] they’re about dignity, identity and social esteem”**

*Michael Sandel,  
Commissioner*

**“People still get their sense of identity, purpose and, to some extent, their worth by work activity”.**

*Rod Dowler,  
Chair of the  
Industry Forum*

### Work should provide dignity

A crucial feature of good work is the respect that workers receive from other members of society for doing their job. The activity of work is a means by which citizens can attain status in the eyes of others, demonstrate their commitment to society, and acquire a sense of purpose from their productive contribution.

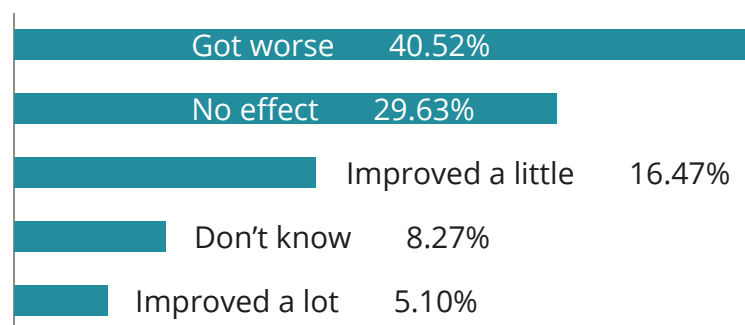
We should respect work for its social value, not simply for the size of the income attached to a job. Too many workers whose jobs are essential to the functioning of our society do not receive the social respect they deserve. This is partly because they are poorly paid. But respect is also about the policies and language with which we describe work. This matters for the way in which work, or forms of work, are perceived by others.<sup>17</sup> For instance, public sector workers should be described in a language of value and esteem, not as an inefficient block to economic progress.

Work that provides dignity enables people to innovate, including with new technologies. We should embrace a variety of new forms of work that offer people the opportunity to use their imagination and ideas to create new products and services.<sup>18</sup> There is likely to be more of this kind of work in the future.<sup>19</sup>

We believe that governments must examine the role of institutions in conferring respect on all types of work, not just on jobs which are highly specialist or which attract a high income. We should provide an environment for workers in which they value and have a sense of belonging. We should reward people who express their capabilities through innovation and entrepreneurship. Above all, our institutions – from trade unions to businesses – should reflect the reality that work is a co-operative and collaborative activity.

Our research in the retail sector, carried out in partnership with the union USDAW, showed that too many people feel that work is leaving them less rather than more fulfilled. Over 40 percent of respondents reported that they felt less fulfilled at work over the last five years and almost 50 percent said they felt less valued by their employer. This must change.

### RETAIL WORKERS ARE FEELING LESS FULFILLED IN THEIR JOBS



Source: USDAW survey in retail, reproduced in annex. Question: ‘How do you feel that the following aspects of your job have changed in the last five years?’ ‘Feeling fulfilled’.

<sup>17</sup> Richard Sennett, *The Corrosion of Character: The Personal Consequences of Work in the New Capitalism* (New York: Norton, 1998).

<sup>18</sup> Work 4.0, “White Paper, Work 4.0: Re-Imagining Work.”

<sup>19</sup> See Chapter 2, and Hasan Bakhshi, Carl Benedikt Frey, and Michael Osborne, *Creativity vs Robots: The creative economy and the future of robots*, (Nesta, April, 2015) [https://www.nesta.org.uk/sites/default/files/creativity\\_vs\\_robots\\_wv.pdf](https://www.nesta.org.uk/sites/default/files/creativity_vs_robots_wv.pdf)

**“The story of one courier we spoke to is illustrative. They referred to the stress and anxiety generated through monitoring. Each delivery they make is broken down into component parts, each of which is timed through logging each step in the app, and then assessed by algorithm with automatic feedback by way of a regular email ranking them against their colleagues”.**

*New Economics Foundation*

## Work should offer security

In an uncertain and turbulent world, work security and stability matter.<sup>20</sup> People feel increasingly insecure about their jobs, their prospects, and their futures.<sup>21</sup> 34% of respondents to a YouGov survey and 41% of our USDAW survey respondents were concerned that the increased use of technology would diminish the security of their jobs. Furthermore, many of the trends we identify in Chapter 2 are forcing individuals to assume ever-greater risks. So while people should be able to reap the rewards of risks they choose to take, they should not be forced to take risks they cannot afford. Work should empower people, not disempower them.

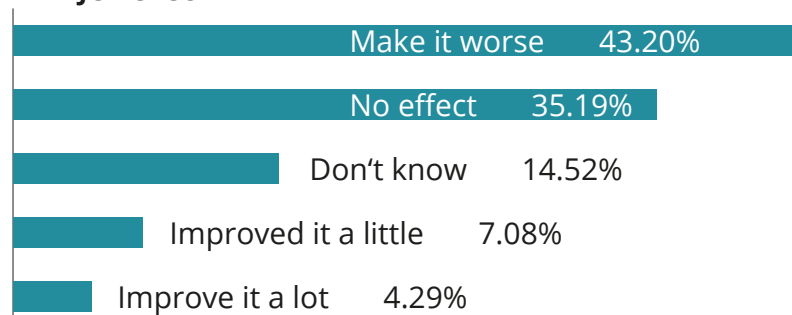
First, work must provide everyone with an adequate income. The gains from the higher productivity generated by harnessing technological change must be fairly shared. We must move beyond thinking that work matters only as a source of income, but we must never forget that income is essential in enabling people to live independent lives and build families.<sup>22</sup> The recent fall in and then flat-lining of real wages, outlined in Chapter 2, has driven increases in in-work poverty. Too many people with respected and indispensable jobs, such as teachers and nurses, retail and office workers, can no longer support themselves and their families with their income from that work.

Second, work must ensure that people’s income is not just sufficient, but also predictable. For people to make choices about their future, they need confidence that their income will be relatively stable over time and not suddenly disappear. The capacity of work to enhance freedom – to empower people to make their own decisions – depends on how far ahead they can see.

We recognise, of course, that no work can be entirely secure. Dynamism drives growth, which in turn underpins job creation, but may sometimes lead to jobs changing or disappearing. People benefit from being able to move jobs or from the flexibility of having several jobs. What matters is that work provides workers with agency and enables them to control their own lives. If people wish to build their lives around secure and stable work, they should be able to do so. If people value more temporary or flexible forms of work, they should be able to find that too.

As in other areas, our research shows that things are moving in the wrong direction – it suggest that many workers now feel that technology is likely to worsen their job security rather than improve it.

### RETAIL WORKERS BELIEVE TECHNOLOGY WILL WORSEN THEIR JOB SECURITY



Source: USDAW survey in retail, reproduced in annex. Question: ‘How do you think increased use of new technology will affect you at work over the next five years?’ ‘Your job security’.

<sup>20</sup> Commission Shift, “Shift: The Commission on Work, Workers, and Technology - Report of Findings” (New America Foundation, 2017), <https://docsend.com/view/4wizcjb>.

<sup>21</sup> Cecilia L. Ridgeway, “Why Status Matters for Inequality,” *American Sociological Review* 79, no. 1 (2014): 1–16.

<sup>22</sup> Gregory Clark, *A Farewell to Alms: A Brief Economic History of the World* (Princeton: Princeton University Press, 2007)

**“We’re nothing now, we’re just numbers”.**

*Christine,  
Sales Representative  
from Cheshire*

**‘They pointed out that you’d spent an extra 30 seconds after the customer had signed and they wanted to know why you’d taken an extra 30 seconds to get back to the van. So they’re able to track you.’**

*Dr Kirsty Newsome*

## Work should promote autonomy

Part of what makes us human is our capacity to live on the basis of our choices. We are capable of reflecting on the principles and values we wish to live by. We choose our goals and ambitions for the future, and we decide how we can best achieve them. This capacity for autonomy, part of our basic humanity, can be undermined by relations of domination – when we are told what to do or what to believe – or through stigmatisation which makes it impossible for people to respect their own judgments and choices.<sup>23</sup>

Good work should reflect our capacity for choice by promoting autonomy. Work that treats people as if they were robots not only fails to respect their capacity for choice, but also suppresses their creativity. The evidence shows that where people are given greater control and direction over their work, they are often more productive. They find creative ways to address the challenges they face in their jobs; autonomy drives innovation at work.<sup>24</sup>

Workers who feel they have autonomy also feel they have responsibility. A workplace that respects people’s capacity for choice is also likely to be one in which workers are motivated to succeed, in which they view their own success as tied to that of their colleagues and their firm. A sense of control is one of the central motivations that drive workers.<sup>25</sup> Work which fails to offer opportunities for people to express themselves, to manage their own tasks or time, is draining; it constrains creativity and collaboration.<sup>26</sup> Evidence submitted by Leicester Work Centre suggests that some new business models are using technology to monitor movement and direct activity simultaneously. This erodes worker autonomy and discretion.

Promoting autonomy requires that workers have an effective voice. They must be able to communicate with each other and with their employers about their work, about the challenges they face and ways of overcoming them. To use people’s skills effectively, employers must know what skills employees believe they have and how they believe they can best be harnessed to solve problems.

Work that promotes autonomy will get the best out of people. As such, promoting autonomy at work benefits not only workers, but employers and businesses too.

<sup>23</sup> See Chapter 7 in Elizabeth Anderson, *Value in Ethics and Economics* (Cambridge, Mass.: Harvard University Press, 1993).

<sup>24</sup> Jean-Pierre Durand, *The Invisible Chain: Constraints and Opportunities in the New World of Employment* (New York: Palgrave, 2007).

<sup>25</sup> See evidence of Dr Kirsty Newsome on the erosion of worker autonomy

<sup>26</sup> Marylène Gagné, Edward L. Deci, and Richard M. Ryan, “The Importance of Universal Psychological Needs for Understanding Motivation in the Workplace” (Oxford University Press, 2014).

**'It's essential to tackle gender and racial inequality in algorithms, STEM - and across the board.'**

*Anne-Marie Imafidon,  
Commissioner*

**Good work should be available to all**

The first four principles describe what good work is, and why it matters. Work that is secure, respects our dignity and offers autonomy is work that offers citizens the opportunity to flourish, to exercise their humanity, and to participate in the collective activity of production.

We have seen that work provides our primary source of income, but it also shapes our identities and communities. It structures our time and our lives; who we feel we are is bound together with the job we do, and the relationships we have with co-workers, service users or customers. The work our economy provides affects not only what we can do, but what we want, the desires we have and the opportunities we seek.<sup>27</sup>

Given that work is such an important part of what it means to be a citizen, and even a human, good work cannot be the preserve of a small proportion of high-income earners. Good work must be available to all. Part of what it means to be a citizen should be to have access to good work. We should take pride in our ambition as a country to provide good work for all, rather than see bad work as the inevitable by-product of competitive capitalism.

Not all need the same kind of work. We do not believe that good work means the same type of work. Our fundamental principles of good work can be applied to a broad range of jobs in a wide range of circumstances. These must reflect the different demands of family, age, vulnerability, voluntary and unpaid work, and so on. We believe that our principles must apply to everyone, without demanding the same kind of work for everyone.

<sup>27</sup> John Rawls, *A Theory of Justice*, Rev. ed. (Cambridge, Mass.: Belknap Press of Harvard University Press, 1999), 7; G.A. Cohen, "Where the Action Is: On the Site of Distributive Justice," *Philosophy and Public Affairs* 2 (1997): 3–30; Samuel Scheffler, "Is the Basic Structure Basic?" in *The Egalitarian Conscience: Essays in Honour of G.A. Cohen*, ed. C. Sypnowich (Oxford: Oxford University Press, 2006).



## MEASURING GOOD WORK

### Why measuring good work matters

What gets measured gets done. So government should begin to measure our progress towards a future of good work, using more realistic standards: not just counting how many people are in work, but having indicators as to the quality of work too. At present, we measure our progress in terms of GDP growth, political freedom,<sup>28</sup> with more people-focused measures such as the Human Development Index,<sup>29</sup> or with measures of wealth and income inequality.<sup>30</sup>

These are all important indicators of our collective progress. Yet these metrics tell us very little about the nature of the work which many people spend so much of their lives doing. To determine whether we are progressing towards a future of good work, we must develop better ways of measuring good work.

### Using the OECD 'job quality' index

The OECD has an index for measuring job quality, in terms of key indicators, including earnings, job security and the work environment. This Commission recommends that the UK Government focuses and begins gathering data on job quality as an important measure of our economic progress and well-being, alongside measurements such as current employment figures, economic inequality, GDP and productivity growth.

Although it is not the only framework for measuring job quality, we consider that the OECD's metric of job quality is the best and simplest way of measuring good work that is currently available. Because the OECD index focuses on OECD countries and relies on consistent and readily-available datasets,<sup>31</sup> and measures the quality of work in different countries, regions or sectors, it enables policy makers and citizens to evaluate how policy changes affect work, and can be used for comparisons of socio-demographic groups and sectors over time.

The central insight of the OECD's framework is that the quality, as well as the quantity, of work is an important component of a healthy labour market.<sup>32</sup> Any purported trade-off between 'good work' and full employment is a chimera. The OECD's view – with which this Commission agrees – is that pursuing the objective of quality work is entirely consistent with increased productivity and high levels of employment. The OECD's job quality framework was endorsed by the G20 Labour and Employment and Labour Ministers.<sup>33</sup>

The OECD job quality index measures job quality along three dimensions:

- **Earnings Quality.** Earnings quality refers to the extent to which the earnings received by workers in their jobs contributes to their wellbeing by taking account of both the average level and the way that earnings are distributed across the workforce.
- **Labour Market Insecurity.** Labour market insecurity measures the risk of unemployment (the risk of becoming unemployed and the expected duration of unemployment) and the degree of

28 Such as through 'Freedom in the World', published annually by Freedom House since 1972. See, Przeworski, A. (2003). *Freedom to Choose and Democracy. Economics and Philosophy*, 19(2), 265-279.

29 See Chapter 2 in Amartya Sen, *Development as Freedom* (New York: Anchor books, 2000).

30 Drew Desilver, "The Many Ways to Measure Economic Inequality," *Factank: News in the Numbers*, 2015, <http://www.pewresearch.org/fact-tank/2015/09/22/the-many-ways-to-measure-economic-inequality/>.

31 The OECD job quality framework relies on a wide number of databases: OECD Earnings Distribution Database for Earnings Quality; OECD Unemployment Duration database, OECD Benefit Recipients database, OECD Labour Market Programmes database and OECD Taxes and Benefits database for labour market insecurity; European Working Conditions Surveys (EWCSs) and International Social Survey Programme (ISSP) for quality of the Working Environment.

32 Matthew Taylor et al., "Good Work: The Taylor Review of Modern Working Practices," 2017, [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/627671/good-work-taylor-review-modern-working-practices-rg.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/627671/good-work-taylor-review-modern-working-practices-rg.pdf).

33 OECD Labour Minister's meeting in Ankara 2015.



public unemployment insurance (coverage of benefits and their generosity).

- The Quality of Working Environment. The quality of working environment captures non-economic aspects of job quality and measures the incidence of job strain that is characterised by a combination of high job demands and few job resources to meet those demands. The incidence of very long hours of work is also used as an alternative indicator of the quality of the working environment since the data required to measure job strain is not available in most emerging economies.<sup>34</sup>

The table below explains the components of the OECD's matrix in more detail:

### BROAD OUTCOME MEASURES OF JOB QUALITY AND THEIR SUBCOMPONENTS

Dimensions	Aggregate outcome measure of job quality	Subcomponents (at the individual level)	Main labour market and social policies that affect job quality
Earnings quality	Earnings index taking into account both earnings level and its distribution.	Level of earnings	Wage setting systems. In-work benefits schemes. Minimum wage.
Labour market security	Expected earnings loss associated with unemployment.	<i>Unemployment risk:</i> <ul style="list-style-type: none"> <li>• Risk of becoming unemployed.</li> <li>• Expected duration of unemployment.</li> </ul> <i>Insurance against unemployment risk:</i> <ul style="list-style-type: none"> <li>• Eligibility to unemployment benefits.</li> <li>• Generosity of benefits (replacement rates)</li> </ul>	Employment protection legislation. Tax and benefit systems. Active labour market policies.
Quality of the working environment	Proportion of workers experiencing job strain (i.e. imbalance between work stressors and workplace resources).	<i>Work-related stress factors:</i> <ul style="list-style-type: none"> <li>• Time pressure at work.</li> <li>• Exposure to physical health risk factors</li> <li>• Workplace intimidation</li> </ul> <i>Support and resources to accomplish job duties:</i> <ul style="list-style-type: none"> <li>• Work autonomy and learning opportunities.</li> <li>• Good management practices</li> <li>• Good workplace relationships.</li> </ul>	Working-time regulations. Health-related labour laws. Sickness insurance schemes. Labour inspection bodies. Vocational training.

<sup>34</sup> See, OECD, "Measuring and Assessing Job Quality," 2015, <http://www.oecd.org/std/labour-stats/job-quality-OECD.pdf>; OECD, "How Good Is Your Job? Measuring and Assessing Job Quality," in OECD Employment Outlook, 2014, 79-139; OECD, "The Quality of Working Lives: Earnings Mobility, Labour Market Risk and Long-Term Inequality," OECD Employment Outlook, 2015, 167-210.

Source: OECD (2014).



## THE NEED FOR CO-OPERATION

This Commission wants Britain to take pride in its ambition and efforts to build a future of good work. It is our firm belief that this will be possible only if the ethos and practice of co-operation sit at the heart of our economy and society. We have become too used to describing the relationship between classes, ethnic groups, regions and nations within the United Kingdom in terms of conflict. We have built cleavages of identities rather than coalitions of shared interests.

Co-operation at all levels will be essential to regain a sense of shared purpose, and work together to harness the benefits of technological change and avoid its pitfalls, as we build a future of good work. As we outline in the next chapter, history shows just how important co-operation can be. Institutions and policies shape the effects of technological change, the extent of disruption, and the ways in which technologies are adopted and diffused across an economy.<sup>35</sup>

At the most basic level, much future work and business growth will depend on co-operation between humans and computers. For instance, research has showed that designing computer and robotic systems so that they can be easily used by workers with intimate knowledge of their industry, to help them understand the processes behind the technology, can significantly lower risks and boost productivity in high-risk industrial production.<sup>36</sup> In fact, new technologies can offer tools for more advanced types of communication and co-operation which support dynamic teamwork, idea-generation, skill-sharing and problem-solving.<sup>37</sup>

Work itself is a co-operative activity – it requires co-operation between employers and workers, and between workers themselves. Many of our recommendations make clear that much closer collaboration between employer and employee will be required to ensure the productivity-boosting power of technology is harnessed, and that it improves the working lives of employees.<sup>38</sup> For instance, our recommendations on corporate governance and decision-making aim to bring employers and employees together in the process of adopting and integrating new technology into British business to ensure the process is both more efficient and fairer. There is good evidence that collaboration and participation in decision-making and enterprise also promotes well-being, and makes workplaces more dynamic and effective.<sup>39</sup>

Most importantly, building a co-operative economy reaches into the rights and responsibilities of many of our most important economic institutions.<sup>40</sup> Research in political science shows that part of the reason why the political economies of societies diverge is that certain types of institutions complement each other over time – most notably, labour relations, corporate finance, and national legal systems.<sup>41</sup> We think that features of Britain's political economy as it currently operates – what the recent Taylor Review of Modern Working Practices characterised as the 'British Way'<sup>42</sup> – have eroded some co-operative institutions. Whilst this approach has its strengths, including high levels of employment, in this Commission's view, co-operation between our economic institutions will be essential to manage and harness the potential of technological change.

35 Daron Acemoglu and James A. Robinson, *Why Nations Fail: The Origins of Power, Prosperity and Poverty*, 1st ed. (New York: Crown Publishers, 2012).

36 Ann Britt Miberg Skjerve and Gyrd Skraaning, "The Quality of Human-Automation Cooperation in Human-System Interface for Nuclear Power Plants," *International Journal of Human-Computer Studies* 61, no. 5 (2004): 649–77.

37 Tim Fryer, "Keep in Touch", *Institution of Engineering and Technology Future of Work*, Volume 12, 2017

38 Ruth Yeoman, "Conceptualising Meaningful Work as a Fundamental Human Need," *Journal of Business Ethics* 125, no. 2 (2014): 235–251.

39 APPG Wellbeing evidence session on 29 February 2017

40 Anonymous, "Scarcity, Conflicts, and Cooperation: Essays in the Political and Institutional Economics of Development," *Journal of Economic Literature* 43, no. 3 (2005): 909.

41 Peter A. Hall and David W. Soskice, *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage* (Oxford, UK: Oxford University Press, 2001), [http://nrs.harvard.edu/urn-3:hul.ebookbatch.OXSCH\\_batch.osouk0199247757](http://nrs.harvard.edu/urn-3:hul.ebookbatch.OXSCH_batch.osouk0199247757).

42 Matthew Taylor et al., "Good Work: The Taylor Review of Modern Working Practices," 2017, [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/627671/good-work-taylor-review-modern-working-practices-rg.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/627671/good-work-taylor-review-modern-working-practices-rg.pdf).



We believe that a wide range of stakeholders should work together through the technological revolution in ways which encourage collaboration, and which recognise the many shared challenges which characterize our economy – slow rates of productivity growth, stagnant wage growth, slow rates of technological adoption, and inequality.

This is why many of our recommendations in Chapter 3 concern fundamental changes to some familiar institutions – labour law, corporate governance, and ways to share the benefits of innovation. These are all areas in which we believe co-operation will be essential if Britain is to harness the full potential of the technological revolution, and build a future of good work from which all British citizens can benefit.

How far these recommendations succeed will depend, in part, on our mindset. Policies do not design or implement themselves. They require a determination to work together. Co-operation as a shared value is crucial to building a future of good work; to the substance of the reforms we discuss; to our communication; to our relationships; to confronting shared challenges; and to making the most of common opportunities.





## CHAPTER 2: THE TRENDS

To know how we are going to build a future of good work, we must understand the major social, economic and cultural trends that are already reshaping the world of work, and will continue to do so in the future.

This chapter sets out those trends. We have sought views from a range of stakeholders, to help us identify the factors that will affect work and the workplace in the future. We found a range of divergent views, most notably about the scope and speed of technologically-driven change, but also about the drivers behind some of the trends we identify.

Nevertheless, there were clear common themes. Most felt that predictions about the end of work – were overstated.<sup>44</sup> We agree with this judgment, which is based on a broad consensus around two themes.

First, the impact of technological change work will be profound. What workers do in almost all jobs will change as the tasks they undertake will require quite different interactions with technologies. As in the past, changes to the nature of work will have considerable social and cultural consequences.

We do not believe that wholesale replacement of people with robots, and so mass technology-driven unemployment, is just around the corner, but there will be significant medium-term disruption to at least some sectors. Policymakers must not be paralysed by uncertainty, but must assess risks and opportunities, and plan accordingly. Doing nothing is the worst option.

Second, how technology reshapes our society and economy – including the extent of disruption – will depend to a large extent on our response. Our future will be shaped by the policy decisions we make as we respond to these trends, and whether we take seriously our ambition to achieve a future of good work.

Michael A. Osborne, one of our Commissioners, has recently conducted research which suggests that one tenth of workers are in occupations that are very likely to grow in size as a result of technological change, whilst one fifth are in fields that are very likely to decline.<sup>45</sup> The impact of technological change on the remaining seven in ten jobs will depend on the manner in which we prepare for, and respond to, change. For many in Britain today, the risks and opportunities of technological change are inseparable; how we navigate them is up to us.<sup>46</sup>

The trends we identify in this chapter inform the policy recommendations we make later in this report.<sup>47</sup>

<sup>44</sup> Richard Berriman and John Hawksorth, 'Will robots steal our jobs? The potential impact of automation on the UK and other major economies' (PWC, March 2017), <https://www.pwc.co.uk/economic-services/ukeo/pwcukeo-section-4-automation-march-2017-v2.pdf>; RSA, 'Age of Automation: Artificial Intelligence, Robotics, and the Future of Low-Skilled Work', September 2017, <https://www.thersa.org/discover/publications-and-articles/reports/the-age-of-automation>; Michael Chui, James Manyika, and Mehdi Miremadi, 'Where machines could replace humans—and where they can't (yet)', McKinsey Quarterly, July 2016, <https://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/where-machines-could-replace-humans-and-where-they-cant-yet>

<sup>45</sup> Hasan Bakhshi Jonathan M. Downing Michael A. Osborne Philippe Schneider, 'The Future Skills of Employment 2030' (Pearson and Nesta, 2017), [https://www.nesta.org.uk/sites/default/files/the\\_future\\_of\\_skills\\_employment\\_in\\_2030\\_0.pdf](https://www.nesta.org.uk/sites/default/files/the_future_of_skills_employment_in_2030_0.pdf)

<sup>46</sup> Srnicek, *Inventing the Future*; Erik Brynjolfsson and Andrew McAfee, *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*, First edition. (New York: WW Norton & Company, 2014).

<sup>47</sup> Work 4.0, "White Paper, Work 4.0: Re-Imagining Work."

## LESSONS FROM HISTORY

The best guide to what might happen in the future, and the role of policy in shaping it, is almost always the past.<sup>48</sup> And the past demonstrates that technology (broadly defined) has been one of the most significant drivers of almost all major shifts in our economy and society.

The first major technological disruption to work was the agricultural revolution, in the late-sixteenth, seventeenth and eighteenth centuries.<sup>49</sup> Driven in part by the Dutch swing plough, agricultural output grew at unprecedented rates, boosting productivity and almost doubling the population of England and Wales to 9 million by 1801.<sup>50</sup> This productivity growth accelerated the decline in the agricultural share of the labour force – from about 75% in the early eighteenth century, to 22% in 1841.<sup>51</sup>

Technological change during the industrial revolution enabled the mass production of goods, using assembly lines and interchangeable labour processes. This threatened the jobs of skilled artisan workers who had previously produced goods in their entirety, leading to the Luddite destruction of machines they believed threatened to undercut their livelihoods. Unskilled workers were the primary beneficiaries of the industrial revolution, as real wages rose faster than GDP per capita from 1760 to 1860.<sup>52</sup>

In the twentieth century, innovations first in manufacturing, and later the arrival of computers and the internet increased demand for skilled workers. This in turn drove educational reforms, which aimed to ensure that all citizens were equipped with the basic cognitive skills and knowledge they needed to be active participants in a labour market which privileged the highly skilled.<sup>53</sup>

One aspect of that process has been the gradual automation and eradication of predictable, routine tasks.<sup>54</sup> In the UK, the share of the workforce employed in manufacturing has declined from 36% in 1841, to just 8% in 2014.<sup>55</sup> The service sector now accounts for about 84% of the workforce,<sup>56</sup> shifting our economy from an industrial economy to a service-based one.<sup>57</sup>

None of these periods of technological revolution have resulted in mass unemployment. Technological change has driven the creation of new jobs, as well as displacing others. However, all have resulted in periods of considerable social and economic disruption, often involving a temporary lag in productivity and wage growth.<sup>58</sup>

The way technological change shapes labour markets and economies has varied through these periods. For instance, while the first industrial revolution increased real wages and gave birth to a large middle class,<sup>59</sup> more recent technological change has tended to ‘hollow out’ middle-income jobs, increase the returns to skill and exacerbate inequality. This means that we cannot assume that current trends will stretch into the future, or that current technological changes will have the same impact on economies and labour markets as earlier disruptions.

All major technology-driven social and economic shifts have involved significant social and political disruption.<sup>60</sup> In that respect, ours is

48 James Furman, former economic advisor to the White House: <https://techcrunch.com/2017/04/20/jason-furman-interview/>

49 Mark Overton, *Agricultural Revolution in England: The Transformation of the Agrarian Economy 1500-1850* (Cambridge: Cambridge University Press, 1996).

50 Note, this innovation was far from the only important one that drove the agricultural revolution. Crop rotation techniques, the development of an enclosure system and national crop markets, and the vast improvements in transport infrastructures across England and Wales were all also crucial factors.

51 Office for National Statistics, “170 Years of Industrial Change across England and Wales,” 2011 Census Analysis, 170 Years of Industry, 2013, <http://webarchive.nationalarchives.gov.uk/20160105160709/http://www.ons.gov.uk/ons/rel/census/2011-census-analysis/170-years-of-industry/170-years-of-industrial-changeponent.html>.

52 Gregory Clark, *A Farewell to Alms: A Brief Economic History of the World* (Princeton: Princeton University Press, 2007); Joel Mokyr, *The Lever of Riches: Technological Creativity and Economic Progress* (New York: Oxford University Press, 1990).

53 Claudia Dale Goldin and Lawrence F. Katz, *The Race between Education and Technology* (Cambridge, Mass.: Harvard University Press, 2008).

54 David H. Autor, “The Skill Content of Recent Technological Change: An Empirical Exploration,” *The Quarterly Journal of Economics* 118, no. 4 (2003): 1279–1333.

55 Chris Rhodes, “Manufacturing: Statistics and Policy,” House of Commons Library, August 6, 2015, <http://researchbriefings.parliament.uk/ResearchBriefing/Summary/SN01942>.

56 Office for National Statistics, “170 Years of Industrial Change across England and Wales.”, June 2013, <http://webarchive.nationalarchives.gov.uk/20160106001036/http://www.ons.gov.uk/ons/rel/census/2011-census-analysis/170-years-of-industry/index.html>

57 David H. Autor, Lawrence F. Katz, and Alan B. Krueger, “Computing Inequality: Have Computers Changed the Labor Market?,” *The Quarterly Journal of Economics* 113, no. 4 (1998): 1169–1213; Georg Graetz and Guy Michaels, “Robots at Work,” IDEAS Working Paper Series, 2015.

58 Mokyr, *The Lever of Riches*.

59 Lipset, “Some Social Requisites of Democracy.”

60 For instance, Robert C. Allen, “The Industrial Revolution in Miniature: The Spinning Jenny in Britain, France, and India,” *The Journal of Economic History* 69, no. 4 (2009): 901–927; Robert C. Allen, “Engels’ Pause: Technical Change, Capital Accumulation, and Inequality in the British Industrial Revolution” 46, no. 4 (2009): 418–435.



likely to be no different. In our own time, as in earlier periods, political institutions are likely to shape the process of change. After the Second World War, government could have tried to restore the pre-war status quo. But instead, Clement Attlee's Labour government managed post-war disruption by establishing the foundations of the modern welfare state. History tells us that institutions and politics matter.

## WIDER SOCIAL AND CULTURAL CHANGES

The following forces are interacting with technological change to transform work. Each will be important in shaping our social and economic future.

### Demographic Change

Several of the submissions to this Commission stressed that increasing life expectancy will shape the future of work.<sup>61</sup> By 2025, there will be 3.7 million more people aged between 50 and 64 in the UK than there were in 2015.<sup>62</sup> The number of people aged over 65 will also grow very significantly. This will lead to an increasing number of individuals dependent on a proportionally smaller labour force. This presents major fiscal challenges for the British state as demand for key public services rises, but revenue from wages declines.<sup>63</sup> One of the core challenges facing the UK labour market will be to ensure that older people are able to remain in work:<sup>64</sup> flexible working practices and retraining may offer a partial solution to this pressing issue.<sup>65</sup>

### Geographic Gaps

The UK has some of the largest regional inequalities in the OECD. The gap in average incomes across regional labour markets has grown. As IPPR identified in their submission to the Commission, the impact of technology on work may exacerbate regional inequalities, as a greater proportion of jobs outside London and the South East are at high risk of automation. Different regions and sectors of the UK economy will experience technological change and its effects differently. Current evidence suggests that some former industrial heartlands may be more susceptible to automation, so that regional inequalities may be exacerbated.

### Globalisation

From 1980 to 2008, the real volume of world trade quadrupled, and grew twice as fast as the increase in world production. Advances in technology drive developments in transport and communications, and make it easier for people to communicate, move and exchange goods over long distances. We do not expect globalisation to reverse in the near future.<sup>66</sup>

### Climate Change

A number of submissions to this Commission stressed the possible disruptive effects of climate change on work. Drought, extreme weather events, increased demand for water, and global food price volatility may all contribute to instability and alter employment patterns.<sup>67</sup> Taking into account our responsibility to address and curb the worst effects of climate change is essential for any discussion on the future of work.

61 Charles Goodhart, Pratyancha Pardeshi, and Manoj Pradhan, "Workers vs Pensioners: The Battle of Our Time," *Prospect*, 2015, <https://www.prospectmagazine.co.uk/magazine/workers-vs-pensioners-the-battle-of-our-time>.

62 Lynda Gratton and Andrew Scott, *The 100-Year Life: Living and Working in an Age of Longevity* (London: Bloomsbury, 2016).

63 Paul Gregg, Laura Gardiner, and Marina Fernandez Salgado, "Wages and the Labour Market Since the Crash" (Resolution Foundation, Forthcoming).

64 TUC, "Shaping Our Digital Future", September 2017, <https://www.tuc.org.uk/sites/default/files/Shaping-our-digital-future.pdf>

65 DWP, "Fuller Working Lives: A Framework for Action" (Department for Work and Pensions, 2014), [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/458861/fuller-working-lives.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/458861/fuller-working-lives.pdf).

66 Paul R. Krugman, *The Accidental Theorist: And Other Dispatches from the Dismal Science*, 1st ed. (New York: Norton, 1998); Paul R. Krugman, "Trade and Wages, Reconsidered," *Brookings Papers on Economic Activity*, 2008, 103; Maarten Goos, Alan Manning, and Anna Salomons, "Explaining Job Polarization in Europe: The Roles of Technology, Globalization and Institutions," *IDEAS Working Paper Series*, 2010.

67 Naomi Hicks and Nicola Ranger, "What Are the Potential Impacts of Climate Change for the UK?," *Grantham Research Institute on Climate Change and the Environment*, 2014, <http://www.lse.ac.uk/GranthamInstitute/faqs/what-are-the-potential-impacts-of-climate-change-for-the-uk/>.

## “[The pace of change in the information technologies industry] is breathtakingly fast.”

Rod Dowler,  
Chair of the  
Industry Forum

### Gender

Women are now the main breadwinners in an increasing number of homes. However, they are still woefully under-represented in the higher echelons of ‘power’ in public and private sectors and the professions; their voices are often not heard in policy debates; and there remains a stubborn gender pay gap. Women also undertake a disproportionate share of unpaid domestic and caring work. Women remain under-represented in science and technological education and work in STEM.<sup>68</sup> In the paid workplace, women are more likely to work in part-time, insecure or in other flexible forms of employment.

### Ethnicity

The UK is a diverse society. Evidence submitted by the TUC suggest that minority ethnic groups are most likely to be suffering from the increase in work ‘instability’: one in 13 BAME employees is in an insecure job, compared to one in 20 white employees.<sup>69</sup> BAME groups are under-represented in the tech sector too.<sup>70</sup>

### Disability

Almost 1 in 5 of the population – 13.3 million people – are disabled but only 3.5 million of these are in employment.<sup>71</sup> Disabled people are nearly three times as likely as non-disabled adults to have no formal qualifications. In addition to other uses, and monitoring, technological innovation could make it easier for to make adjustments which enable disabled workers to participate in the workforce. We must alert to the impact – good and bad – of technological change on inequalities across the board, and consider the role of government, as well as business, to support more people to engage in the labour market.

## TECHNOLOGICAL CHANGES

The policies which this Commission outlines aim to build and protect a future of good work – but they begin with the very real challenges of the present. So we have explored the basic current and anticipated technological innovations, many of which are still in their infancy.<sup>72</sup> This section summarises technological trends in three related areas: digitisation and computing, artificial intelligence (AI), and robotics.<sup>73</sup>

### Digitisation and computing

Digitisation has already opened up new possibilities for collaboration and production, for the organisation of businesses, and for the sale of goods and services. For instance, the internet now enables communication not only between people, but also between things. The fact that almost 50 billion devices worldwide are internet-enabled presents enormous possibilities for enterprise in the future.<sup>74</sup>

For the digital revolution to continue at the same speed, processing power will be critical, along with developments in bandwidth and data storage capabilities. Just over thirty years ago, less than 1 percent of the world’s technologically stored information was in digital format. By 2008, the figure was 94%, rising to 99% by 2014.<sup>75</sup> Overall, depending on which standard is used, computer performance has improved since manual computing by a factor between 1.7 trillion and 76 trillion.<sup>76</sup>

68 [https://www.ippr.org/files/publications/pdf/women-in-engineering\\_Sept2014.pdf](https://www.ippr.org/files/publications/pdf/women-in-engineering_Sept2014.pdf), <http://stemettes.org/>

69 Commission Evidence: add reference

70 Race for Opportunity, Sector Factsheet: Ethnic Minorities in Science, Technology, Engineering and Mathematics (STEM), 2015, [https://race.bitc.org.uk/sites/default/files/rfo\\_sector\\_factsheet\\_set\\_vfinal\\_new\\_2.pdf](https://race.bitc.org.uk/sites/default/files/rfo_sector_factsheet_set_vfinal_new_2.pdf)

71 Figures from Disabled Living Foundation September 2017. – a rate of 46% compared with 84% of non-disabled people

72 Hasan Bakhshi Jonathan M. Downing Michael A. Osborne Philippe Schneider, ‘The Future Skills of Employment 2030’ (Pearson and Nesta, 2017), [https://www.nesta.org.uk/sites/default/files/the\\_future\\_of\\_skills\\_employment\\_in\\_2030\\_0.pdf](https://www.nesta.org.uk/sites/default/files/the_future_of_skills_employment_in_2030_0.pdf)

73 This is one of the central arguments of Brynjolfsson and McAfee’s, *The Second Machine Age*. This is not an exhaustive list of important technological developments. The internet now plays a hugely important role in many of the tasks required by numerous professions. Internet use has risen in the UK, and is likely to continue to rise. 99 percent of adults aged 16 to 24 regularly use the internet, compared to 39 percent of adults aged 75 years or above (ONS, 2016). According to Cisco’s *Visual Networking Index*, global internet traffic will for the first time reach over 1 zettabyte in 2016. To put that in perspective, one zettabyte is the equivalent of 36,000 years of high-definition video, or streaming the entire catalogue of Netflix 3,177 times (Cisco, 2016).

74 Ericsson CEO to shareholders: 50 billion connections by 2020, 13 April 2010, <https://www.ericsson.com/en/press-releases/2010/4/ceo-to-shareholders-50-billion-connections-2020>

75 Martin Hilbert and Priscilla López, ‘The World’s Technological Capacity to Store, Communicate, and Compute Information,’ *Science* 332, no. 6025 (2011): 60–65.

76 William D. Nordhaus, ‘Two Centuries of Productivity Growth in Computing,’ *The Journal of Economic History* 67, no. 1 (2007): 128–159.



Whether processing power can continue to advance at the same rate is unclear. It is also uncertain whether we can develop sufficiently sophisticated new hardware and software to sustain the current pace of change. Nevertheless, we can still expect significant and rapid developments in digitisation and computing, as well as novel applications across sectors and activities.<sup>77</sup>

### Artificial Intelligence (AI)

AI systems are machines that can perceive their environment and take actions they decide will be most likely to achieve pre-determined goals. There are two broad types of AI. 'Narrow AI' performs a set of concrete tasks which have clear applications, many of which are commercial. These include recommending products, playing games, translation, self-driving cars, planning trips, or medical diagnosis.

'General AI' is machines which exhibit 'intelligent', that is, analytical behaviour which is at least as advanced as humans in all cognitive capacities. Narrow AI has already had consequences for our economy, whereas there is considerable uncertainty about whether and to what extent general AI can be achieved. Given this, we agree with a 2016 Obama White House report that narrow AI should be the primary focus of public policy.<sup>78</sup>

The term 'narrow' AI should not be taken literally. The applications of narrow AI systems are vast, and growing. Drawing insights from neuroscience and physiology, artificial neural networks have been created in which many hundreds of layers of processing enable the performance of increasingly complicated tasks.<sup>79</sup>

Many new business models aim to provide services by harnessing AI to use the vast amounts of data produced by people and the objects they own. For instance, applications already use our data to suggest destinations for our next holiday, work out the fastest route to a hotel, and offer restaurant recommendations en route. In the workplace, AI systems can be used to track performance, monitor breaks, dictate routes, and flag anomalies in the behaviour of employees – even involving the microchipping of employees – raising novel legal and ethical questions.<sup>80</sup>

In health and medical services, vast databases of patient information, research publications, genetic history, and information about the success of previous treatment strategies combined with sensors, are used to offer personalised cancer treatment.<sup>81</sup> Predictive analytics, using statistical methods to sift data on outcomes for patients, is increasingly used in diagnoses, and telemedicine is supporting treatment at home.<sup>82</sup>

Many of these applications can be of immense value to our society. NASDAQ and the London Stock Exchange use AI systems to detect patterns of trading behaviour which suggest insider trading; Visa uses a neural network system to detect likely fraudulent transactions; manufacturing firms use AI to schedule operations in large plants; and NASA uses a variety of AI systems to schedule the complicated process of loading their space shuttles and preparing them for launch.<sup>83</sup>

At present, many of the latest advances in AI are being driven by two related areas of innovation: big data and machine learning (ML). ML

77 *The Economist*, "After Moore's Law," 2016, <http://www.economist.com/technology-quarterly/2016-03-12/after-moores-law>.

78 White House, "Artificial Intelligence, Automation, and the Economy." December 2016, <https://obamawhitehouse.archives.gov/sites/whitehouse.gov/files/documents/Artificial-Intelligence-Automation-Economy.PDF>

79 Royal Society, *Machine learning: the power and promise of computers that learn by example*, April 2017, <https://royalsocietypublishing.org/~/media/policy/projects/machine-learning/publications/machine-learning-report.pdf>

80 Evidence from Leicester Work Centre and workshop; Josie Cox, US tech company becomes first to microchip employees, *The Independent*, 24 July 2017, <http://www.independent.co.uk/news/business/news/us-tech-company-microchip-employees-first-three-square-market-wisconsin-a7856971.html>

81 Hagop Kantarjian and Peter Paul Yu, "Artificial Intelligence, Big Data, and Cancer," *JAMA Oncology* 1, no. 5 (2015): 573–574.

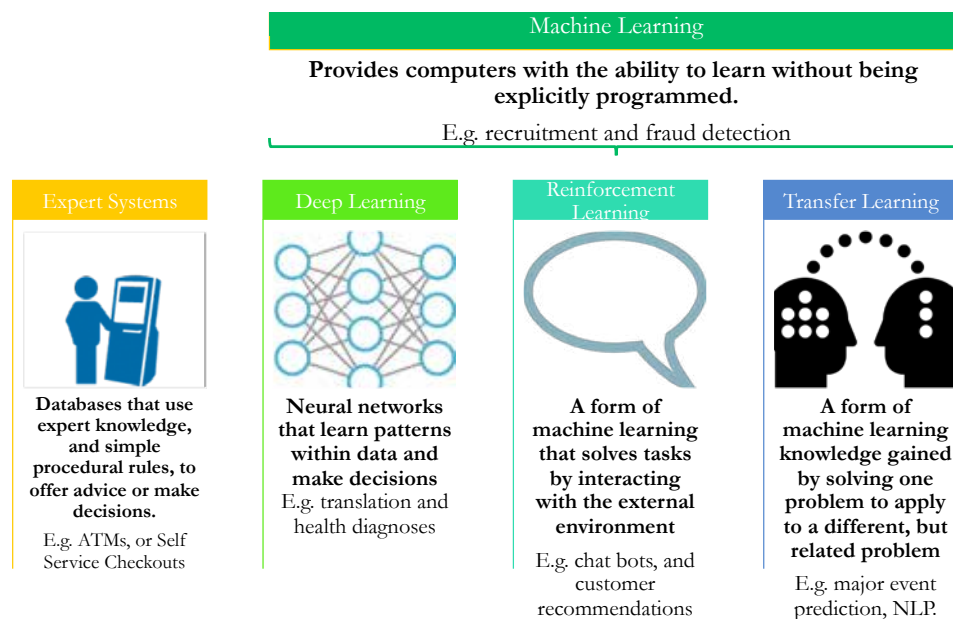
82 Richard Susskind and Daniel Susskind, *The Future of Professions: how technology will transform the work of human experts*, Oxford: Oxford University Press, 2015; 'A Digital Revolution in healthcare is speeding up', *The Economist*, 2 March 2017, <https://www.economist.com/news/business/21717990-telemedicine-predictive-diagnostics-wearable-sensors-and-host-new-apps-will-transform-how>

83 Leslie Kaelbling and Perez Lozano, "What Is Artificial Intelligence (AI)?" (*Techniques in Artificial Intelligence*, MIT, n.d.).



systems use vast sets of data to find rules and patterns that allow for AI to make powerful predictions. This can involve supervised, unsupervised or reinforcement learning. Unlike traditional software, the rules and patterns used by a ML system can be learned from patterns in data, rather than explicitly specified by a human designer. This means that to improve and refine AI systems, humans no longer have to specify the steps the system must take to achieve the desired outcome.

This combination of ML and big data-sets is producing AI systems with applications in fields as diverse as commercial recommender systems, gaming, fraud detection, legal research and medical imaging. Sources like online search engines, e-commerce, businesses, social media, science, and government all produce billions of data points which can be analysed by sophisticated algorithms and used to provide intelligent recommendations about, or analyses of, real-world problems.<sup>84</sup> These innovations offer the potential for immense efficiency gains and other benefits, if the considerable challenges for our working lives and regulatory framework, including data protection, are resolved. A recent Royal Society and IPSOS MORI poll showed that most people interacted with ML every day, but only 9% of people recognize this.<sup>85</sup> We note that AI innovation is a particular strength in the UK, with new AI start-ups launching almost every week.<sup>86</sup>



<sup>84</sup> Viktor Mayer-Schönberger, *Big Data: A Revolution That Will Transform How We Live, Work, and Think* (Boston: Houghton Mifflin Harcourt, 2013).

<sup>85</sup> Royal Society, *Machine learning: the power and promise of computers that learn by example*, April 2017, <https://royalsociety.org/~media/policy/projects/machine-learning/publications/machine-learning-report.pdf>

<sup>86</sup> Scott Carey, 'AI Start-ups to watch', *TechWorld*, 25 September 2017, <https://www.techworld.com/picture-gallery/startups/uk-ai-startups-watch-hottest-machine-learning-startups-in-uk-3645606/>



## Robotics

Robots are machines which perform manual tasks in physical environments.<sup>87</sup> Many jobs which involve a range of physical tasks can only be automated if there are significant and sustained advances in robotic technology. But many robots and AI systems struggle to overcome the obstacles presented by the physical world, with all its inherent complexity and uncertainty. To automate these physical tasks, robots must be capable of harnessing the power of AI, big data and computing to automate manual tasks.

Robotic technology has made significant advances in recent years. Articulated robots were the first type of robots to be used across industry. These have arms which can perform specific mechanical tasks such as packaging goods or welding car parts. They traditionally use pre-programmed rules and can perform only repetitive tasks in static environments.

The latest robots are much more dextrous and capable of performing complex tasks in uncertain environments. For example, General Electric has built a robot capable of climbing wind turbines to carry out routine repairs and maintenance, whilst other robots can now perform complicated and high-risk medical operations.<sup>88</sup> Even within manufacturing, robots can now perform much more intricate tasks. El Dulze, a Spanish food processor, uses robots to select only the heads of lettuce that meet the company's standards.<sup>89</sup>

Many of these developments have been made possible by increasingly sophisticated sensors. Self-driving cars – a major innovation with significant potential for disruption in the automotive industry as vehicles evolve towards full autonomy<sup>90</sup> – use sophisticated sensors to gather data which is stored in on-board road maps to make rapid decisions about where to go, how fast to drive and when to brake. Big data complements the use of robotics and algorithms, for example, by using sensors to gather information about current road conditions which they compare with historical data about weather conditions.<sup>91</sup>

These advances in the capabilities of robotics can drive huge cost reductions. McKinsey found that the price of robots has fallen by an average of 10% annually.<sup>92</sup> The International Federation for Robotics (IFR) estimates that within the next decade, it will be possible to purchase industrial robots which cost half today's price.

87 RSA, "Age of Automation: Artificial Intelligence, Robotics, and the Future of Low-Skilled Work", September 2017, <https://www.thersa.org/discover/publications-and-articles/reports/the-age-of-automation>

88 Robots VO, "A Roadmap for U.S. Robotics: From Internet to Robotics" (Robotics in the United States of America, 2013).

89 IFR, "68 Robots Perform Farmer's Work: Case Study of Fanuc Robotics Europe S.A" (International Federation of Robotics, 2012).

90 Kersten Heineke, Philipp Kampshoff, Armen Mkrtchyan, and Emily Shao, "Self-Driving Car Technology: When will robots hit the road?", May 2017, <http://www.mckinsey.com/industries/automotive-and-assembly/our-insights/self-driving-car-technology-when-will-the-robots-hit-the-road>

91 Carl Benedikt Frey and Michael A. Osborne, "The Future of Employment: How Susceptible Are Jobs to Computerisation?" *Technological Forecasting & Social Change* 114 (2013): 20–21.

92 MGI, "Disruptive Technologies: Advances That Will Transform Life, Business, and the Global Economy" (McKinsey Global Institute, 2013).

**'It's just so fast at finding things on an MRI scan. It runs 1000s of algorithms concurrently.'**

*Cyril, an IBM engineer on Watson*

In the future, robots are likely to become even more capable. They will be able to augment human capacity – for example, in the form of prosthetic limbs; and to communicate with one another, using data generated by robots thousands of miles away and machine learning processes to hone the precision with which they complete their tasks; and to learn from their human co-workers using re-enforcement learning AI approaches.

**Articulated Robots**



**Robots with rotary joints.**

E.g. car manufacturing and advanced surgery

**Assistance Robots**



**Assist humans in the functioning of everyday tasks**

E.g. prosthetics and stroke therapy

**Humanoid Robots**



**Robot with a body shape built to resemble the human body**

E.g. Lifting patients in care, and customer services

**Mobile Robots**



**Robotic machine capable of locomotion**

E.g. Medicine transport in hospitals

**Amphibious Robots**



**Versatile robots for outdoor robotics tasks**

E.g. industrial inspect, search and rescue.





## ECONOMIC CHANGES

These technological innovations lie behind many wider transformations in our economy and labour market. To make informed choices about how to build a future of good work, we must begin with what we know about current challenges and transformations.

The key point here is that technological change is behind the familiar challenges the British economy faces – slow rates of productivity growth, stagnant real wages, increasing income and wealth inequality. The exact role technology plays in shaping these wider trends varies. In some instances, technology is the primary driver; in others, it is interacting with existing trends by either exacerbating or muting them. Either way, we should not separate the debate about the future of work from the immediate need to address these challenges. They are inextricably linked.

### The pace and scope of change

Although the speed of technological disruption has fuelled anxieties about whether we are marching towards the ‘end of work’ or the ‘robot age’, the precise speed of automation, and its broader impact, is uncertain.<sup>93 94</sup> However, this Commission believes that the overall pace of change may be increasing.

First, the technological advances described above make it possible to automate a greater range of tasks than ever before. Since AI and robotics can now perform not just routine low-skilled tasks but also increasingly complex cognitive tasks and those requiring fine motor skills, the reach of new technologies will be broad and deep. The current wave of automation will reach into sectors of our economy that have traditionally been considered ‘safe’, such as skilled workers in the service sector performing complex cognitive or analytic tasks.

Second, the pace of technological innovation and breadth of applications may well have increased, as a result of the accessibility of new technology, recent developments in machine learning, and the use of huge new data sets to feed it. In 2004, it was widely agreed that a driverless car was ‘hard to imagine’.<sup>95</sup> Just six years later, Google had already developed the first self-driving car. In 2016, the number of human interventions or ‘disengagement’ in journeys made by a test vehicle more than halved.

The ancient game of Go originated in China 2500 years ago. In 2016, researchers at DeepMind used deep neural networks to train AlphaGo on 30 million moves learned from humans, and then unleashed AlphaGo to learn by playing thousands of games against itself (‘reinforcement learning’). In 2016, Alpha Go beat Lee Sedol, the world’s Go Champion in a series of matches.<sup>97</sup> This year, the Alpha Go team created Alpha Go Zero that learned from scratch, by playing games against itself, with no additional instructions. In three days it had defeated all versions of Alpha Go and within 40 days it had independently identified game ‘principles’ developed by humans over 3000 years.<sup>98</sup>

93 Ford, *Rise of the Robots*; Brynjolfsson and McAfee, *The Second Machine Age*.

94 Most of the submissions this Commission received drew attention to these two reasons, expressing some skepticism about their extent, but agreeing that these were the two most important considerations for policy makers to consider. See also, Andrew Haldane, “Labour’s Share” (Speech, Trades Union Congress, November 12, 2015), <http://www.bankofengland.co.uk/publications/Pages/speeches/2015/864.aspx>.

95 Frank Levy, *The New Division of Labor: How Computers Are Creating the next Job Market* (Princeton, NJ.: Princeton University Press, 2004).

97 Royal Society, *Machine learning: the power and promise of computers that learn by example*, April 2017, <https://royalsociety.org/~media/policy/projects/machine-learning/publications/machine-learning-report.pdf>

98 DeepMind blog October 18 2017

**'It tends to be that jobs are getting more automated and getting worse, that's what I'm seeing, rather than disappearing.'**

Ellie,  
Trade Union Organiser

It is not surprising that predictions about the extent of full automation – the complete replacement of human workers with machines – vary widely. Predictions about the proportion of jobs likely to be affected – rather than automated – vary much less. Most published studies conclude that most British jobs will be affected, with 30 percent significantly affected.<sup>99</sup> The key studies on automation in the British labour market to date are:

- **Michael A. Osborne and Carl Frey**, of the Oxford Martin Institute, estimated in 2013 that 35% of British jobs were at threat of (some) automation.<sup>100</sup> This research was carried out 4 years ago and is widely credited for establishing a blueprint to assess the impact of automation on occupations in the UK. They developed a machine-learning algorithm to estimate the probability of 'computerisation' for different occupations by reference to O\*NET an on-line database of US job descriptions that does not exist in the UK, and ONS statistics. (Michael Osborne is one of our Commissioners.)
- **The Bank of England** used Osborne and Frey's blueprint for its own estimate, in 2015, that up to 15 million jobs in the UK were at risk of automation.<sup>101</sup> The Governor reiterated this view in December 2016.<sup>102</sup>
- **The OECD** estimated in July 2016 that 9% of British jobs are at risk of full automation but that 35% of the workforce will have to adapt significantly. The report has received widespread approval for its 'task-based' approach, because automation tends to be task-based too.<sup>103</sup> The study is based on the OECD's Survey of Adults Skills which covers task composition and transfers Osborne's approach to this task-based data.
- **McKinsey Global Institute** estimates that only 5% jobs are candidates for full automation. However, their model also suggests that 30% of jobs are 70% automatable.<sup>104</sup>
- **PWC** estimates that up to 30% of British jobs are at high risk of automation by the 2030s.<sup>105</sup> Its report emphasises that for individual workers, the key differentiating factor is education. For those with just GCSE-level education, the estimated potential risk of automation is as high as 46%, but this falls to 12% for those with degrees.

As our visual below explains, the difficulty of accurate prediction lies, in part, in the 'lag' between the development of a new technology, its integration into the workplace and its widespread adoption across the sector. It also lies in the different methods of calculation – including varying thresholds for the classification of a 'fully' automated job – and the framing of the figures.

Another reason for varying predications is the poor quality or incomplete sectoral data which inform these calculations. Given these, there is less variation between the current estimates than is often suggested. Even so, in-depth and sectoral research analyses, such as those initiated by Commissioners Daniel Susskind and Michael A Osborne this year, are set to be more accurate than those reliant on occupation or task classifications derived from US macro-economic data.

<sup>99</sup> Richard Berriman and John Hawksorth, 'Will robots steal our jobs? The potential impact of automation on the UK and other major economies' (PWC, March 2017), <https://www.pwc.co.uk/economic-services/ukeyo/pwcukeyo-section-4-automation-march-2017-v2.pdf>

<sup>100</sup> In partnership with Deloitte. Submission by Deloitte to Commission December 2016

<sup>101</sup> Andrew Haldane, "Labour's Share" (Speech, Trades Union Congress, 12 November 2015), <http://www.bankofengland.co.uk/publications/Pages/speeches/2015/864.aspx>

<sup>102</sup> Mark Carney, "The Spectre of Monetism" (Roscoe Lecture, Liverpool John Moore University, 5 December 2016), <http://www.bankofengland.co.uk/publications/Pages/speeches/2016/946.aspx>

<sup>103</sup> OECD, July 2016

<sup>104</sup> McKinsey Global Institute, *A Future that Works: Automation, Employment and Productivity*, January 2017, <https://www.mckinsey.com/global-themes/digital-disruption/harnessing-automation-for-a-future-that-works>

<sup>105</sup> Richard Berriman and John Hawksorth, 'Will robots steal our jobs? The potential impact of automation on the UK and other major economies' (PWC, March 2017), <https://www.pwc.co.uk/economic-services/ukeyo/pwcukeyo-section-4-automation-march-2017-v2.pdf>



We have identified five factors which affect the pace and impact of technological innovation in the UK economy:

## THE FACTORS WHICH AFFECT THE PACE OF THE ADOPTION OF TECHNOLOGY

### 1. TECHNICAL FEASIBILITY

WHEN WILL NEW TECHNOLOGIES THAT MIGHT PERFORM IN A 'LABORATORY' ENVIRONMENT TURN INTO 'REAL-WORLD' SOLUTIONS?

### 2. COST

THE BUSINESS RATIONALE FOR ADOPTING A NEW TECHNOLOGY WILL BE DIRECTLY RELATED TO COST. RECENT STUDIES OF COST REDUCTIONS HAVE DEMONSTRATED THE UNPREDICTABILITY OF COST CHANGES OVER TIME.

### 3. LABOUR MARKET TRENDS

THE SUPPLY, PRICE AND SKILL OF LABOUR WILL PLAY AN IMPORTANT ROLE IN BUSINESSES' DECISION ABOUT WHEN TO ADOPT AUTOMATED SOLUTIONS.

### 4. INVESTMENT DECISIONS

THE UK ECONOMY IS CHARACTERISED BY UNDER-INVESTMENT IN TANGIBLE AND INTANGIBLE ASSETS. BUSINESSES HAVE ADOPTED A MORE CAUTIOUS APPROACH TO INVESTMENT THAN IN MANY EQUIVALENT ECONOMIES.

### 5. SOCIAL ACCEPTANCE AND REGULATION

THE UK PUBLIC RANKS RELATIVELY LOW ON OPENNESS TO TECHNOLOGICAL SOLUTIONS, WHEN COMPARED WITH THE EUROPEAN AVERAGE. SOCIAL ATTITUDES WILL DRIVE BOTH UPTAKE AND REGULATION OF NEW TECHNOLOGY.

## In the UK, our challenge is too few robots – not too many

At present, the pace of adoption of new technologies is slower in the UK than in other countries, and that pace is slowing. CEBR recently found that new industrial robots installed in the UK in 2015 were down 21% from 2014 levels, and the country has just 33 robots per 10,000 employees – one of the lowest in OECD economies – compared to the global average of 69 per 10,000 employees.<sup>106</sup> This means robot sales in Britain have fallen below the levels of industrial robots acquired by competitors in France, Germany, Italy and the US,<sup>107</sup> reflecting a trend of low investment spending in tech.<sup>108</sup> A recent RSA report finds that only 14% of employer respondents are currently investing in new technology or plan to do so in the near future, even though 43% agreed that new technologies would lead to greater prosperity in the long run. So, our chief economic problem is not that robots are taking our jobs: it is that we are not adopting and integrating new technology fast enough.

<sup>106</sup> CEBR, "Will Post-Brexit Britain Hinder a Robo-Revolution" (Centre for Economic and Business Research, 2017), <https://cebr.com/reports/new-study-shows-u-s-is-world-leader-in-robotics-automation/>.

<sup>107</sup> International Federation of Robotics, World Robotics Report 2016, September 2016, [https://ifr.org/img/uploads/2016-09-29\\_Press\\_Release\\_IFR\\_World\\_Robotics\\_Report\\_2016\\_ENGLISH.pdf](https://ifr.org/img/uploads/2016-09-29_Press_Release_IFR_World_Robotics_Report_2016_ENGLISH.pdf)

<sup>108</sup> World Bank, Gross Capital Formation (% GDP) for UK 1960-2016, <https://data.worldbank.org/indicator/NE.GDI.TOTL.ZS?locations=GB>



Evidence submitted to the commission by LSE economist Alan Manning emphasized that sluggish productivity and real wage growth in Britain are far more likely to be driven by lower levels of investment in people and machines than by too many robots.

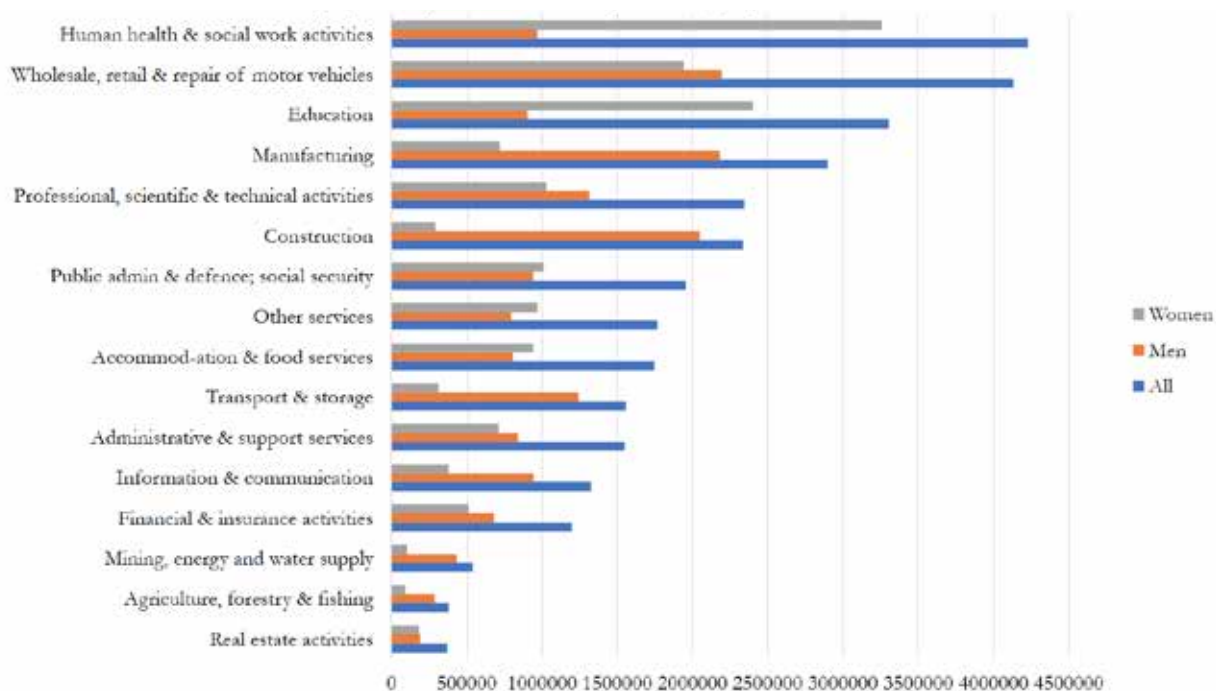
Evidence, including unpublished research, submitted by Professor John Hudson from the University of Bath highlighted lukewarm attitudes to robotic care for the elderly and (less so) to autonomous vehicles. Views differed markedly between the generations, genders and those living in and outside cities,<sup>109</sup> with young males living in urban environments most in favour.

Our polling and survey evidence both suggest that today, although working people have concerns about the impact of technology on job security and pay in particular, they recognise the potential for improvement. 63% of respondents to our YouGov survey across regions and sectors support or strongly support increasing investment in technology at the workplace. The percentage of respondents working in healthcare who support such investment is notably higher than those in retail and transport, where disruption is likely to be more intense.<sup>110</sup> This level of popular support is striking, given that respondents are also concerned about inadequate training, information and consultation about the introduction of new technology at work.

### Labour market effects

The pace and extent of the impact of technology on work will vary considerably across activities, occupations, and wage and skill levels. This chart breaks down the UK labour market by sector and gender.

### EMPLOYMENT IN UK LABOUR MARKET BY SECTOR AND GENDER



Note: Source: Future of Work Commission analysis of Labour Force Survey, 2017.

109 Int J of Soc Robotics 2016 DOI 10.1007/s12369-016-0384-5

110 People's Attitudes to Robots in Caring for the Elderly Commission YouGov Survey



This analysis shows the diversity of the UK labour market and the UK's 31 million jobs. As a result, the impacts of technology will be multiple, rather than singular. It also shows the prominence of some sectors that we will show are vulnerable to automation, including retail, transport, and administration and support services.<sup>111</sup>

## DISTRIBUTION OF JOBS: HOW WILL THE LABOUR MARKET CHANGE?

### 'Routine'/'non-routine' polarisation may reduce in the long term

The traditional assumption has been that jobs based on routine tasks are vulnerable to automation, and non-routine (often cognitive) tasks are not. Developments in AI and Machine Learning mean that this distinction is unlikely to be so clear-cut in the future.<sup>112</sup> Even in the recent past, polarisation or 'hollowing out' has not been a major trend in the UK labour market, as Resolution Foundation research confirms.<sup>113 114</sup>

Our analysis supports the emerging consensus that even the limited polarisation we have seen in the last few decades is unlikely to continue in the medium to long term. As the capabilities of robotics and AI continue to grow, automation will continue to spread into more complex, varied and dynamic non-routine tasks.<sup>115</sup>

Many mid-skill jobs, associated with polarisation, combine tasks which are vulnerable to automation with those that are not. These jobs cannot easily be unbundled.<sup>116</sup> This means that they are more likely to transform over time, as routine aspects of work are phased out, rather than be automated completely.

Remaining tasks are likely to involve more collaboration between machines and humans. There is considerable scope for policy and regulation to shape the precise way in which this plays out.

### The power of the high-skilled over the low-skilled may further increase

In public debate to date, there has been too much emphasis on the impact of technology on those currently working in mid-skill jobs. This emphasis is not supported by the evidence, and has led to an insufficient focus on low-skilled jobs.<sup>117</sup> Skill-biased technological change is likely to raise the productivity of high-skill workers as it decreases demand for many low- to mid-skill routine-intensive occupations.<sup>118</sup> It is also likely to increase competition from displaced workers for other low-skill jobs which are not susceptible to automation, and consequently place downward pressure on wages in those sectors.

This is particularly important in the UK, since workers in low-skill occupations account for 45% of the UK labour market, or 13.9 million workers. Low-skill workers tend to be concentrated in sectors like transport and storage, retail, accommodation, administration, health and social work. New developments in technology, particularly as a result of the combined power of AI and robotics, have produced intelligent and mobile machines that can perform tasks which require dexterity, judgement, and perception, such as packing boxes in

111 We have done some provisional work in this area, including a survey in retail and transport, and received some high-quality evidence addressing particular sectors and specialisms.

112 David H. Autor, "Why Are There Still So Many Jobs? The History and Future of Workplace Automation," *Journal of Economic Perspectives* 29, no. 3 (2015): 3–30.

113 Adam Corlett, "Robot Wars: Automation and the Labour Market" (Resolution Foundation, July 2016). Jobs in the middle of the income and skill distribution have not 'hollowed out' as much or as fast as some predicted, nor as much as has occurred elsewhere in the OECD

114 The UK economy may have been 'resilient' to the hollowing-out effect in part because consumer spending in the services sector has been strong: as prices fall, disposable income increases, fuelling demand for other services. Deloitte, "From Brawn to Brains: The Impact of Technology on Jobs in the UK," 2015, <https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/Growth/deloitte-uk-insights-from-brawns-to-brain.pdf>.

115 For example, our evidence from the British Retail Consortium states that "as retailers look to find further productivity gains automation is likely to play a significant role".

116 Autor, "Why Are There Still So Many Jobs?" 26–27.

117 In fact, the very concept of low-skilled is imperfect, as many occupations including care work are emotionally demanding, if not technically demanding. RSA, "Age of Automation: Artificial Intelligence, Robotics, and the Future of Low-Skilled Work."

118 Deloitte, *Transformers: How Machines Are Changing Every Sector of the UK Economy*, 2016, <https://www2.deloitte.com/uk/en/pages/technology-media-and-telecommunications/articles/transformers.html>.



warehouse.<sup>119</sup> It is low-skill workers who typically perform such jobs: they are likely to feel the sharpest effects of automation.<sup>120</sup> Workers who are displaced from their jobs – due to factory closures or the relocation of companies – have been shown to experience sustained declines in their wages.<sup>121</sup> This process can often be highly localised in particular geographical areas.<sup>122</sup>

If we are to build a future of good work, we must recognize the risk that the power of the high-skilled over the lower skilled is likely to increase without appropriate policy intervention. Workers at all skill levels will need support for life-long learning and ‘upskilling’, excluding extensive opportunities to retrain. This presents a real challenge, and forms an important part of our recommendations in Part 3.

### Further Reductions in Working Hours

Predictions that average working hours will fall as a result of technological changes have a long history. John Maynard Keynes<sup>123</sup> wrote in 1930 that by 2030 the average working week would shrink to fifteen hours, as new technologies would displace workers faster than humans could adapt their skills. Though Keynes’s prediction was overambitious, its thrust was accurate. The average working week in the UK has fallen from about 50 hours per week in 1900 to around 30 hours today.<sup>124</sup> This reduction in working hours can be seen across OECD countries.

In the future, notwithstanding flat-lining this year as reported by the Office for Budget Responsibility,<sup>125</sup> we can expect average working hours per week to decline further. This ought to *enhance* productivity levels. Workers who work fewer hours tend to be more productive: as working time increases, average output per hour decreases.<sup>126</sup> In countries with higher levels of productivity, people tend to work fewer hours per week on average, whereas in countries with lower levels of productivity, people tend to work longer hours.

Fewer working hours does not necessarily mean fewer jobs. Germany and the Netherlands have some of the lowest average annual hours worked in Europe and yet very low unemployment rates. We should aspire to a labour market which offers more leisure time, and still offers valuable jobs for everybody.

### More Divisible Work

In recent years, UK labour markets have seen a significant increase in forms of work other than standard employment contracts: what is often called ‘atypical work’ includes a significant element of what is called the ‘gig economy.’ There are now 5 million self-employed workers, 900,000 workers on zero hours contracts, and 800,000 agency workers in the UK.<sup>127</sup> Levels of divisible work vary between sectors, for example, over 40% of the creative sector is self-employed.<sup>128</sup>

Our evidence from NASUWT, the teachers’ union, suggests that the growth of online platforms for purchase of goods and services has facilitated the movement towards short-term contracts. NASUWT identified the concern that this may lead to a ‘race to the bottom’ in which regular, secure, full-time employment may be replaced with precarious, low-paid, insecure and irregular work.<sup>129</sup>

119 RSA, “Age of Automation: Artificial Intelligence, Robotics, and the Future of Low-Skilled Work”.

120 Mathew Laurence, *Future Proof: Britain in the 2020s* (IPPR, December 2016), David H. Autor, David Dorn, and Gordon H. Hanson, “The China Syndrome: Local Labor Market Effects of Import Competition in the United States,” *American Economic Review*, 103, no. 6 (2013): 2121–2168. <https://www.ippr.org/publications/future-proof-britain-in-the-2020s>

121 Steven J. Davis and Till Von Wachter, “Recessions and the Costs of Job Loss,” *Brookings Papers on Economic Activity* 2011, no. 2 (2011): 1–72.

122 David H. Autor, David Dorn, and Gordon H. Hanson, “The China Syndrome: Local Labor Market Effects of Import Competition in the United States,” *American Economic Review*, 103, no. 6 (2013): 2121–2168.

123 In *Economic Possibilities for our Grandchildren* (1930),

124 Andrew Haldane, “Labour’s Share” (Speech, Trades Union Congress, November 12, 2015), <http://www.bankofengland.co.uk/publications/Pages/speeches/2015/864.aspx>.

125 Ibid, report November 2017

126 Marion Collewet and Jan Sauerermann, “Working Hours and Productivity,” *Labour Economics*, 2017.

127 Stephen Clarke, “Atypical’ Day at the Office: Tackling the problems of atypical work (Resolution Foundation, July 2017), [http://www.resolutionfoundation.org/app/uploads/2017/07/Chapter\\_five\\_precarious\\_work-WEB.pdf](http://www.resolutionfoundation.org/app/uploads/2017/07/Chapter_five_precarious_work-WEB.pdf)

128 <https://www.gov.uk/government/statistics/creative-industries-focus-on-employment>

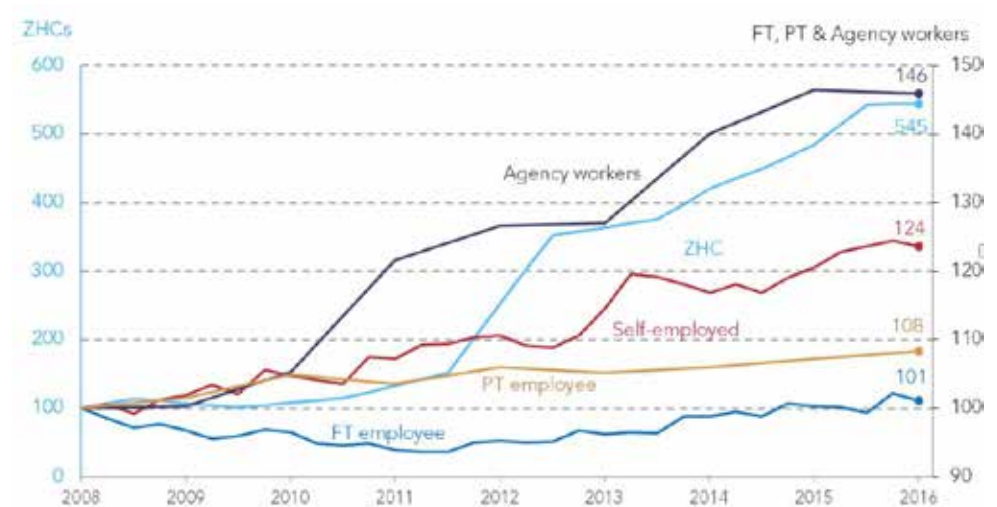
129 Commission Evidence: NASUWT submission

**“For thirteen years I worked as a subcontractor (subbie) electrician. I had to find jobs through temporary employment agencies who processed my wages through off-shore Umbrella companies. These companies forced me to pay employer’s NI contributions on top of my own and charged me a fee. Furthermore, they calculated my income tax and NI not on my real earnings but on minimum wage, which then denied money to HM Treasury.”**

*Harrison Moore,  
Electrician*

These kinds of less formal labour relationships are not new, as two submissions noted. The majority of workers still work in ‘standard’ employment relationships. But we have seen a qualitative change in the UK economy, as employees are more typically found performing ‘atypical work’. Since 2008, the number of self-employed workers has grown by 24%, the number of agency workers has increased by 46%, and the number of workers on zero hour contracts has increased by more than 400%.<sup>130</sup> Atypical workers earn less on average than full-time employees both in absolute terms and per hour. They are more likely to be women, younger and less qualified than full time employees. This workforce is more vulnerable to exploitation.

### GROWTH IN VARIOUS FORMS OF EMPLOYMENT SINCE THE FINANCIAL CRISIS



*Notes: Full-time and part-time employees, and the self-employed do not include people on ZHCs or working for an agency. The figures for agency workers includes some who are on ZHCs and vice versa.*

*Source: RF analysis of ONS, LFS (Forthcoming)*

Technological change is only part of the explanation for this wider shift. Some of the recent rise in atypical work is likely to be cyclical rather than structural, as the Resolution Foundation recently argued. That may explain why 80% of employment growth in the last year has been in full-time work. Similarly, technological trends are shaping economies across the OECD, but the UK has seen unusually high levels of growth of atypical work, and unusually high levels of growth in so-called ‘self-employment’. These have not diminished.

<sup>130</sup> Resolution Foundation, *Forthcoming*. Check whether published.

**'As a society we have failed to give sufficient attention to the importance of human creativity as an economic resource.'**

*Sir Christopher Pissarides*

The evidence we received suggests that this is largely the result of the UK tax system, in which the national insurance advantage of self-employment incentivises employers and workers to register as self-employed where possible. This is an advantage to 'employers', but means that the self-employed worker loses many of the legal and benefit entitlements of an employee.<sup>132</sup>

This incentive to classify those on the margins as self-employed rather than employed workers will only increase as the national living wage rises and as our labour market tightens over the coming years. Policy makers should recognise that our current framework of law actively encourages atypical working. Atypical work is not the consequence of immutable technological forces – but of our policy choices.

This rise of atypical work, combined with the gradual decline in union membership, has changed the nature of labour relations more broadly. Andrew Haldane, Chief Economist at the Bank of England, has recently argued that these changes have resulted in work that is more 'divisible'. Workers are more divisible at the level of profession, sector or firm, and the rise of self-employment and part-time work has made work more divisible at the level of the individual. Haldane suggests that this increase in the divisibility of work has contributed to sluggish wage growth. There is a wage premium associated with trade union membership, of around 10-15%;<sup>133</sup> whereas self-employment is associated with a 15% wage discount for workers compared with employed workers performing the same work.<sup>134</sup> Shifts in the nature of work, driven in part by technological change, are leading to diminished collective bargaining, the depression of wages and more localised rates of pay.

### **Sectoral Analysis: Where will there be jobs in the future?**

Almost every occupation will involve new relationships with technology. But technology will have diverse impacts across the sectors of the UK's labour market: some will grow, some will shrink, others will move up the skill distribution, and others down it. This Commission has undertaken a survey and a poll and received submissions which look at how technology will affect some of these sectors.<sup>135</sup> In these preliminary observations, we will first look at the sectors we expect to grow, and then those at risk of considerable disruption.

Our evidence suggests that particular growth can be expected in the following sectors:

- Health and Social Care
- Creative Industries
- Leisure
- Technology and Telecommunications ('Tech')

The growth of the service sector is likely to be the major driver of employment growth in the future. The service sector already accounts for about 80% of GDP in the UK – and includes a high proportion of low-paid, low-skilled jobs. This will make it harder to escape the low-value, low-productivity circle in which the UK economy is currently trapped.

The anticipated growth of the service sector is partly because of the number of jobs which involve high levels of human-centred, creative or interpersonal skills – those skills most likely to be resilient to

132 The Resolution Foundation have calculated that it benefits an employer well over £2K for a £30K annual spend to 'employ' the self-employed : add ref

133 Alex Bryson, "Union Wage Effects," IZA World of Labor, 2014.

134 Andrew Haldane, "Work, Wages and Monetary Policy" (Speech, Bradford, 2017).

135 It draws from our own poll, broken down by sector, and the USDAW survey, which covers the retail and distribution/transport sectors. Our analysis is led by our Economic Advisor, Sir Christopher Pissarides and draws from a private presentation to Commissioners in December 2016.



automation. An outstanding example is health and social care, whose delivery requires human skills which are hard to automate.<sup>136</sup> Recent OECD data<sup>137</sup> demonstrates that a relatively high proportion of the time allocation of social care roles is spent on tasks demanding 'social intelligence' and 'creativity'. There is already a marked increase in the employment of home-based personal care workers, childcare workers, and mental health support officers.<sup>138</sup> Jobs and activities involving caring and social skills are set to increase further.

But even sectors like health and social care should expect some disruption. A not insignificant, but lower, proportion of the health and social care workforce are at some risk of automation.<sup>139</sup> This important as a higher proportion of these jobs are in the public sector: government, as an employer, must plan carefully for disruption.<sup>140</sup> We note that our YouGov respondents in the health and social care sectors had the highest level (43%) of enthusiasm for increasing investment in new technologies to undertake and support their work.

The creative economy is one of Britain's fastest growing sectors,<sup>141</sup> relying on human creativity combined with the technical skills that are most likely to flourish over the next few decades. We expect it to grow further and become an increasingly important part of the British economy through job creation and new roles, some of which do not yet exist.<sup>142</sup> Similarly, we think the human-centred leisure industries focused on recreation, entertainment, sport and tourism will expand to fill additional leisure time as our hours of work diminish.

Another major growth sector will be technology and telecommunications. Tech companies tend to generate more economic profit than any other sector of the global economy.<sup>143</sup> Tech industries working in the fields of AI, data analytics, fintech, biotech, immersive technologies<sup>144</sup> and gaming all show impressive growth levels. The number of AI jobs in Britain has about soared 485% since 2014.<sup>145</sup> Many technology-related jobs did not exist at all in 1990.<sup>146</sup> Significant job growth in the technology-related sectors will continue.<sup>147</sup>

What about sectors at most risk of disruption or contraction? The evidence we have reviewed tells a consistent story: the risk of automation is still greatest to occupations and tasks that are often in low-skill, low-pay sectors: transport and storage, retail and administration and support services. Although other activities are transforming – as our Commissioner Daniel Susskind highlights in 'The Future of the Professions' – the pace and extent of automation in these traditional, British working-class sectors is likely to remain highest.<sup>149</sup>

Our preliminary observations are consistent with the conclusions of other recently published reports, our submission from Deloitte and the oral evidence from McKinseys Digital. The sectors containing the highest proportion of jobs at high risk of automation over the next two decades are: the traditional retail and wholesale,<sup>150</sup> transport and storage sectors.<sup>151</sup> Retail – a focus sector for this Commission – is likely to be the single largest sector affected by automation, in terms of numbers of employees affected although the growth of e-commerce will offset job losses in part. Over 15% of the UK workforce is employed in retail, broadly defined to include logistics, sales, packaging and distribution.<sup>152</sup>

136 Demographics suggest that an increasing number of elderly people needing care will add to demand in this sector

137 RSA, *The Age of Automation: Artificial intelligence, robotics and the future of low-skilled work*, September 2017, [https://www.thersa.org/globalassets/pdfs/reports/rsa\\_the-age-of-automation-report.pdf](https://www.thersa.org/globalassets/pdfs/reports/rsa_the-age-of-automation-report.pdf)

138 Ibid

139 Deloitte's estimated 28% in their submission. PWC estimates that 17 percent of jobs in this sector are at risk, <https://www.pwc.co.uk/press-room/press-releases/Up-to-30-percent-of-existing-UK-jobs-could-be-impacted-by-automation-by-early-2030s-but-this-should-be-offset-by-job-gains-elsewhere-in-economy.html>

140 Deloitte, *State of the State 2016-17 Report*, October 2016, <https://www2.deloitte.com/uk/en/pages/public-sector/articles/state-of-the-state.html>. Deloitte suggests that more than 850,000 public sector jobs could be lost by 2030

141 Add Nesta, FT, *Shadow DCSM and creative industries report refs. Employment has grown faster than the workforce as a whole with particular areas of growth music and arts, followed by IT, software and computer services*

142 <https://www.nesta.org.uk/six-jobs-for-2030>. Our Commissioner Michael A Osborne partnered with Nesta, Pearson and Oxford Martin to envisage hypothetical roles that could exist in 2030

143 Tushar Bhatia, Mohsin Imtiaz, Eric Kutcher, and Dilip Wagle, *How tech giants deliver outsized returns and what it means for the rest of us*, September 2017, <https://www.mckinsey.com/industries/high-tech/our-insights/how-tech-giants-deliver-outsized-returns-and-what-it-means-for-the-rest-of-us>

144 Definition of economic profit use is net operating profit less the cost of capital.

144 Evidence of Paul Wilmott Head of Digital at McKinseys.

145 Data from Indeed and analysis by Mariano Mamertino

146 Carl Frey and John Hawksworth, "New Job Creation in the UK: Which Regions Will Benefit Most from the Digital revolution?" (PWC, 2015).

147 A recent report by the Social Market Foundation concluded that 640,000 jobs are expected to be created in the science, engineering and technology sectors, double the average rate of overall job growth over this period.

149 Richard Susskind and Daniel Susskind, *The Future of Professions: how technology will transform the work of human experts*, Oxford: Oxford University Press, 2015.

150 Deloitte submission estimated loss of 58% of the workforce, 2.2 million jobs

151 Deloitte submission estimated loss of 74 % of the workforce, 1.52 million jobs. As for transport, PWC estimates that 56 p% jobs are at high risk. Narrowly defined, this makes up just 5 % employment share. But broadly defined (i.e. all types of transportation and support for transportation) the transport sector employs about 2.2 million people. Similarly, PWC research concludes that retail and wholesale risks 2.3 million jobs, with 44 % of all UK jobs estimated to be at high risk. <https://www.pwc.co.uk/press-room/press-releases/Up-to-30-percent-of-existing-UK-jobs-could-be-impacted-by-automation-by-early-2030s-but-this-should-be-offset-by-job-gains-elsewhere-in-economy.html>. Add caveat – Leicester work shop – cheap fashion production lines

152 Chris Rhodes and Philip Brien, *The retail industry: statistics and policy*, Parliament Briefing Paper, Number 06186, 9 October 2017.

## 'This Commission wants to encourage more fledgling companies to stay on these shores and to address anxiety over scale and social impact investment.'

Emma Mulqueeny

The traditional transport sector can expect greater disruption, with about half of current jobs at risk.<sup>153</sup> Broadly defined, including types of transportation and support for transportation, the transport sector employs about 2.2 million people.<sup>154</sup> With particular regard to the traditional transport sector, the overall impact on employment in all sectors at high risk of disruption could potentially match the collapse of the steel and shipbuilding industries. Again, however, emerging transport-related sectors, such as electric vehicles and repair services, will generate new jobs. The extent to which workers are actually displaced will depend on how we address worker transition and other policy choices.

Our YouGov poll suggests that the gravity of risk to the existing retail and transport sectors is not widely appreciated. Only 7% of respondents in retail estimated that 75% of their role could be automated in 5 years' time, whereas 16% thought that their role was not at all vulnerable. In the transport sector, 29% of respondents thought their roles would be unchanged in 5 years' time, whereas only 7% thought that over 75% of their role was susceptible to automation.<sup>155</sup> This research, combined with recent RSA research, suggests that, separately, employers anticipate a much higher level of automation than employees.<sup>156</sup> There is scope for much higher levels of communication between business and workers which, among other things, would assist more granular and accurate levels of prediction.

The overall impact in regions is likely to vary hugely, where sectors and particular types of jobs are often concentrated. A recent analysis by Future Advocacy<sup>157</sup> highlights that Britain's former industrial heartlands in the Midlands and North are more vulnerable – at least in the short term – because of a concentration of jobs in risk sectors. So, without policy intervention, the technological revolution is set to exacerbate regional inequalities.

We think that Industrial Strategy must actively manage and plan for disruption in all sectors – not just technology-related, high productivity sectors – and take account of how automation will impact different parts of the UK differently.

### BROADER ECONOMIC EFFECTS

Technological change is not only driving changes to our labour markets, but lies behind other, broader trends in our economy. This section sets out four of these broader changes that present especially acute and immediate challenges – ones that we must address if we are to achieve our ambition of building a future of good work.

#### Enterprise

Many of the world's biggest technical businesses have started small in Britain or are based on ideas created by UK-based scientists. Our rate of new business creation has increased more quickly than any other OECD country:<sup>158</sup> Britain is a great place to start a business. But this has not led to scale up in the UK, higher levels of productivity or significant national growth. The Commission believes we need to look at what is happening and why, to inform policy and encourage scale-up of tech-based businesses in the UK. This matters – to boost productivity and

<sup>153</sup> *Ibid.* PWC estimates that 56% jobs are at high risk

<sup>154</sup> *Ibid.*

<sup>155</sup> Add other stats and not counter-intuitive acknowledgement that a high proportion of tasks are technical and could be undertaken by automated technologies.

<sup>156</sup> RSA, "Age of Automation: Artificial Intelligence, Robotics, and the Future of Low-Skilled Work", September 2017, <https://www.thersa.org/discover/publications-and-articles/reports/the-age-of-automation>

<sup>157</sup> <https://static1.squarespace.com/static/5621e990e4b07de840c6ea69/t/59e777fcd7bdce3041b57/ac3/1508341775530/FutureAdvocacy-GeographicalAI.pdf>

<sup>158</sup> OECD, *Entrepreneurship at a Glance* 2017, 2017, [http://dx.doi.org/10.1787/entrepreneur\\_aog-2017-en](http://dx.doi.org/10.1787/entrepreneur_aog-2017-en)

because British scale-up companies are more likely to create higher quality jobs, with more satisfied employees.<sup>159</sup>

The evidence we have reviewed suggests that Britain is becoming more 'entrepreneurial'. Early-stage entrepreneurial activity in Britain has risen steadily,<sup>160</sup> and 2016 was a record year for start-ups – 657,790 compared to 608,110 in 2015.<sup>161</sup> The British early-stage enterprise rate in tech-related industries is particularly strong, including new and emerging sectors in AI, data analytics, robotics, biotech, and fintech. Even here, there are still challenges. For instance, an almost total lack of investment in immersive technologies has forced several British early-stage start-ups to move to the US this year.<sup>162</sup> Further, evidence submitted to the Commission suggests that many more young people wish to start their own business than are able to do so<sup>163</sup> and Britain still lags behind in the global entrepreneurial league tables (48th).<sup>164</sup>

We have observed that entrepreneurs in our country face two related problems: the problem of attracting investment for scale-up, and inadequate support for small and medium size enterprises (SMEs).

First, low levels of domestic investment are holding back the scale-up of these early stage companies. We agree with the observations made by Sherry Coutu in her Scale-Up Report that 'competitive advantage doesn't go to the nations that focus on creating companies, it goes to nations that focus on scaling up companies.'<sup>165</sup> It is telling that that four out of five of the world's biggest AI start-up acquisitions in the last five years involved UK companies, such as Google's purchase of DeepMind in 2014. And since then, Apple has bought Cambridge-based language processing specialists VocalIQ, Microsoft bought the machine-learning powered keyboard SwiftKey in February this year, and Twitter acquired Entrepreneur First Alumni in June.<sup>166</sup>

Collaborative initiatives – combining public and private support – are needed to increase the ability of companies to scale up and grow businesses in Britain. Many British SMEs cite the low proportion of GDP invested or reinvested,<sup>167</sup> and difficulties accessing finance to serve domestic markets. Others cite inadequate physical and digital infrastructure.<sup>168</sup> Research indicates that about 2.7 million SMEs wished to grow but were not able to.<sup>169</sup>

Yet British SMEs account for the highest proportion of private sector business – 99% of all businesses were defined as small or medium sized at the start of 2016 – and are responsible for 60% of all private employment, as well as an annual turnover of £1.8 trillion.<sup>170</sup> In our view, we need concerted effort to support enterprise and scale up in British SMEs. Improving innovation and productivity in SMEs should translate into good jobs for our citizens, now and in the future, as well as more inclusive growth.<sup>171</sup> If we address the British 'scale-up gap', Nesta has estimated that an additional boost of about £96 billion is possible within 3 years, and in the longer term there is potential of £225 billion additional GVA.<sup>172</sup>

159 Of employees surveyed in high growth companies, 80 percent stated they were 'satisfied' or 'very satisfied' with their current job compared to 46 percent when asked about their previous job. Harshet Lunani, Endeavor: Multiplying Impact through High Quality Jobs, 2012, <http://share.endeavor.org/pdf/GlobalEmployeeSurveys.pdf>

160 Evidence from Liam Byrne MP Office Standard Enterprise Pack' rose from 6.42 percent in 2003 to 8.61 percent in 2014

161 Startupbritain.org

162 Our Commissioner Dr Nadia Danhash sits on the Immersive Industries Council

163 RBS Youth Enterprise Youth Tracker, <https://www.rbs.com/content/dam/rbs.com/rbs/PDFs/Sustainability/Downloads/populusrbsenterprisetracker4thquarter2014-finalfullreport.pdf>, RSA, A Manifesto for Youth ENTERPRISE: making the UK a Better Place to Start a Business, <https://www.thersa.org/discover/publications-and-articles/reports/a-manifesto-for-youth-enterprise-making-the-uk-a-better-place-to-start-up-a-business>

164 <http://www.gemconsortium.org/country-profile/121>

165 Sherry Coutu, *The Scale Up Report on Economic Growth*, November 2014, <http://www.scaleupreport.org/scaleup-report.pdf>

166 Scott Carey, 'AI Start-ups to watch', *TechWorld*, 25 September 2017, <https://www.techworld.com/picture-gallery/startups/uk-ai-startups-watch-hottest-machine-learning-startups-in-uk-3645606/>

167 IPPR Economic Justice Commission report October 2017 based on World Bank R&D spend data: over the past 20 years UK spending on public and private R&D is only 1.7 percent compared to 2.8 percent in US, 2.9 percent in Germany and 3.5 percent in Japan. In addition to low relative relatives of government investment, large firms are 'hoarding' profits and failing to re-invest in innovation of skilled workforces: private sector business spending crashed to almost half of previous R&D spend – as above. Similarly, the OECD Report for 2017 showed that low levels of business investment was compounding the productivity challenge, <http://www.oecd.org/eco/surveys/United-Kingdom-2017-OECD-economic-survey-overview.pdf>

168 Coutu, *The Scale Up Report on Economic Growth*

169 Deloitte, *The Scale Up Challenge: An Impact Report*, 2014, <https://www2.deloitte.com/content/dam/Deloitte/uk/Documents/strategy/deloitte-uk-scale-up-challenge.pdf>

170 UK Small Business Statistics, 2016, <http://www.jsb.org.uk/media-centre/small-business-statistics>

171 Arancha González Laya, *How Small Companies can change the world*, World Economic Forum, 14 October 2015, <https://www.weforum.org/agenda/2015/10/how-small-companies-can-change-the-world/>; SME Competitiveness Outlook, <http://www.intracen.org/SMEOutlook/SMECO2016/>

172 Deloitte, *The Scale Up Challenge*.



Technology-related sectors bring additional challenges. In particular, there is a striking trend towards consolidation.<sup>173</sup> There are a number of reasons for this, including new data-driven business models (‘the new oil’<sup>174</sup>) and aggressive expansion into new markets.<sup>175</sup> This Commission thinks it is time to start thinking about the impact this is having on innovation and enterprise in Britain.

### Productivity and Wages

Almost all the submissions we received identified the productivity crisis as one of the greatest challenges facing Britain today. As the Office for Budget Responsibility November 2017 report<sup>176</sup> has highlighted, this is not a challenge we must address in the future, but one that confronts us now. The ‘crisis’ identified in evidence submitted to us involved two related changes: the slowdown in productivity growth and wages,<sup>177</sup> and the uncoupling of productivity growth from wage growth. We believe both of these problems are connected to current technological changes.

The UK’s sluggish productivity growth is a long-term problem.<sup>178</sup> For the past twenty years, productivity growth has been driven by a small number of high-tech sectors, such as ICT. This is partly about the relative productivity performance of sectors of the UK economy: more than half of UK sectors have seen falling, not rising, productivity. But as the Bank of England recently argued, it is also about slowing rates of technological diffusion from ‘frontier firms’ to other, less productive firms. We have a long tail of less productive firms that have experienced stagnant, or falling, productivity.<sup>179</sup>

This is enormously important, because productivity is the cornerstone of the UK’s future GDP growth. Given our ageing population, sustained growth above 1% of GDP will require productivity growth, which in turn will mean that we will need to embrace the productivity-boosting effects of new technology.

173 There are a number of possible reasons for this including the rise of data and ‘information’ as a signal of supply, demand and value, rather than labour or money – beyond scope of this report but cite work. Note Google’s record EC 2.4Billion fine for market dominance based on its 90 percent control of internet access. Joseph Stiglitz, ‘Are markets efficient or do they tend towards monopoly? The verdict is in’, World Economic Forum, 18 May 2016, <https://www.weforum.org/agenda/2016/05/joseph-stiglitz-are-markets-efficient-or-do-they-tend-towards-monopoly-the-verdict-is-in/>

174 Clive Humby, Sheffield mathematician, who, along with his wife, invented the Tesco Clubcard, coined this term in 2006.

175 And innovative use of fused technologies such as use of AI fused with cryptography and digital technology to respond automatically to price fluctuations E.g. IBM’s Dynamic Pricing, <https://www.ibm.com/us-en/marketplace/dynamic-pricing>; full analysis and commentary on these developments go beyond the scope of this report.

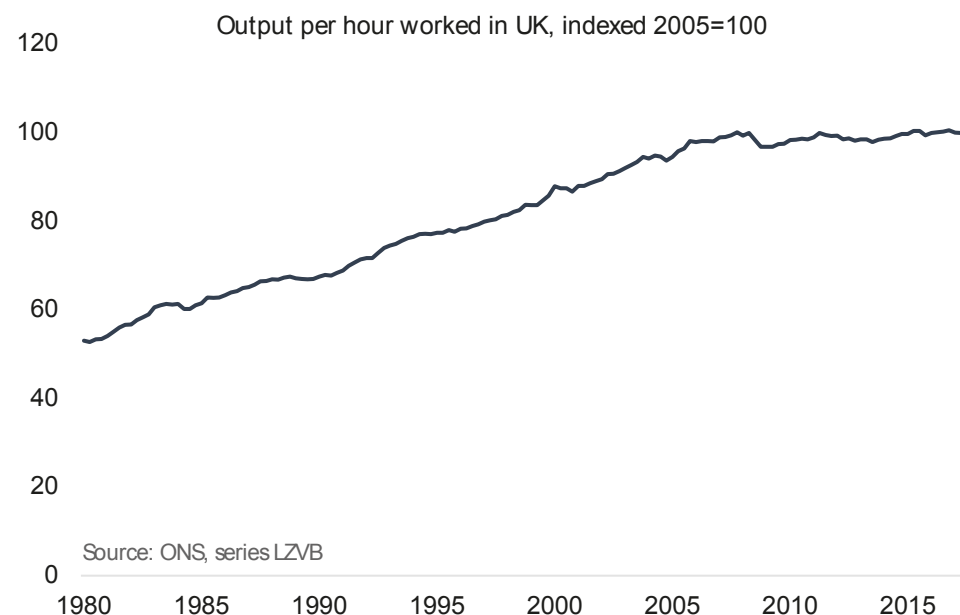
176 <http://budgetresponsibility.org.uk/efo/economic-fiscal-outlook-november-2017/>

177 The OBR and ONS noted a drop in the growth of real wages in November 2017: <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/articles/supplementaryanalysisofaverageweeklyearnings/latest>

178 The OBR acknowledges that more weight should now be placed on weak performance of the recent past as a guide to the outlook for the next few years: [http://budgetresponsibility.org.uk/docs/dlm\\_uploads/EFO-briefing-speaking-note-November-2017-.pdf](http://budgetresponsibility.org.uk/docs/dlm_uploads/EFO-briefing-speaking-note-November-2017-.pdf)

179 Andrew Haldane, ‘Productivity Puzzles’, (Speech, 20 March 2017), <http://www.bankofengland.co.uk/publications/Pages/speeches/2017/968.aspx>

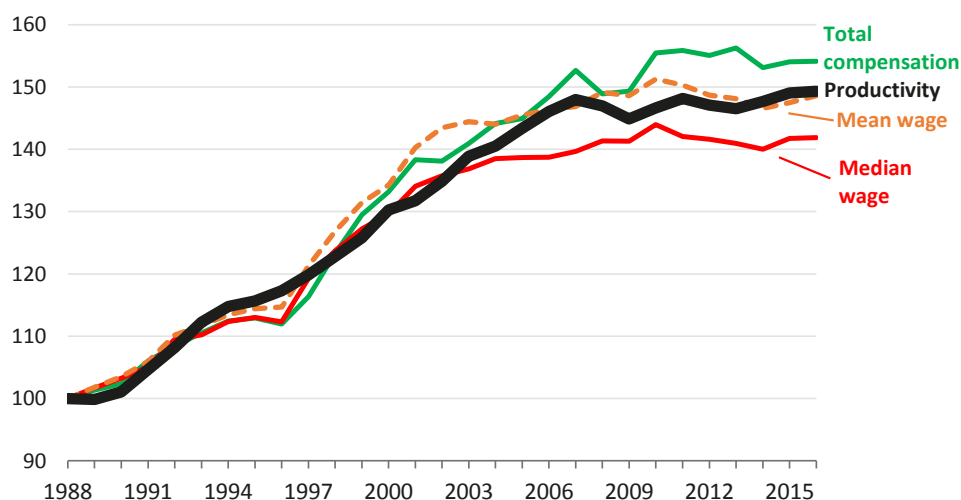
### UK PRODUCTIVITY 1980 - 2017





Just as serious is the more recent trend, even in sectors and businesses in which productivity *is* rising, for wages to grow more slowly than productivity – and for real earnings to fall.<sup>180</sup> Until the late 1990s, productivity and wages grew broadly in tandem, but in the last two decades, productivity and real wages have begun to uncouple. Even when there are productivity rises, this has not been reflected in wage rises.

### UK PRODUCTIVITY COMPARED WITH AVERAGE WAGES 1988-2016



Sources: Commons Library calculations based on ONS data: productivity is GVA per hour; total compensation of employees per employee job; ASHE data for median and mean full-time weekly wages (Great Britain only)

Why is this? First, pensions have begun to consume a growing share of productivity growth, meaning that returns to productivity are going to past workers rather than current workers. Second, a growing gap has opened up between mean and median wages. That is a direct consequence of wage inequality, which is itself driven partly by technological change – and which generates very substantial profits for a small number of shareholders and technologically-able highly-paid employees, and squeezes those with ‘mid-skilled’ roles.

A presentation to the Commission from Professor Nolan Director of the Leicester Work Centre highlights that this narrative has been lost in many current analyses of our contemporary productivity predicament. He argues that the diminishing role of labour’s collective organisation and voice is contributing to productivity deficits in the UK. There is a strong case for renewed focus on labour, work and employment issues as part of contemporary analysis of the causes and remedies to the UK productivity deficit.

#### Labour’s Share

Until relatively recently, many believed that the share of national income returned to capital and the share returned to labour was essentially fixed. Recent evidence undermines that assumption. While labour’s share of national income remained relatively stable for most of the twentieth century, it has declined in recent decades across most OECD economies. In broad terms, this means that the differentials

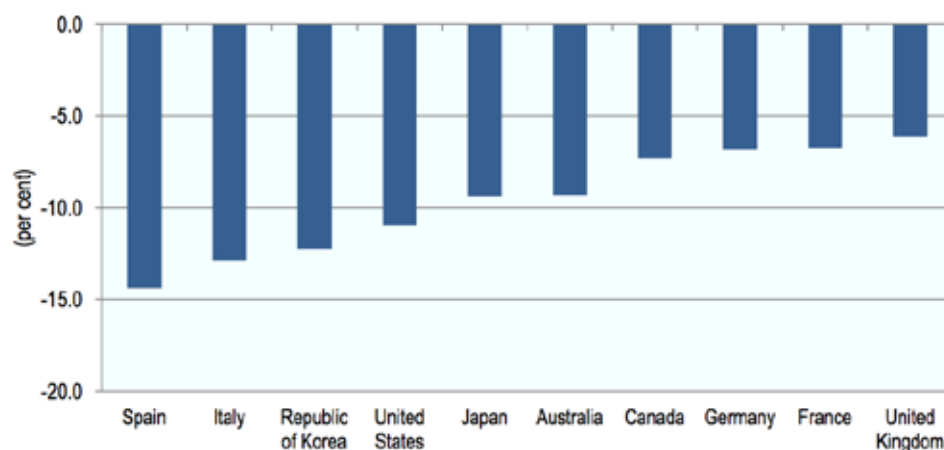
<sup>180</sup> Ibid



between money made by owning things and money made by working are growing.

Research by the Bank of England shows that in the last two decades, labour's share in the UK has begun to decline quite rapidly, and particularly in the last decade or so since the economic crisis. Since the financial crisis, real wages have fallen faster than UK productivity: since 2009, labour's share of national income has fallen from around 58 percent to 52 percent.<sup>181</sup> Although the fall of labour's share in the UK has been less pronounced than elsewhere, it is still significant.<sup>182</sup>

### FALL IN LABOUR SHARE IN G20 COUNTRIES, 1970-2014



*Note: Figures refer to the change in the adjusted labour share between 1970-2014 for advanced economies.*

*Source: ILO based on AMECO Database and ILO Databases. OECD (2015).*

181 Andrew Haldane, "Labour's Share" (Speech, Trades Union Congress, November 12, 2015), <http://www.bankofengland.co.uk/publications/Pages/speeches/2015/864.aspx>.

182 International Labour Organisation, "The Labour Share in G20 Economies," G20 Employment Working Group (Antalya, Turkey: OECD, February 26, 2016), <https://www.oecd.org/g20/topics/employment-and-social-policy/The-Labour-Share-in-G20-Economies.pdf>.

183 Weicheng Lian, Mai Chi Dao, and Zsoka Koczan, "Drivers of Declining Labor Share of Income," IMF, (2017), <https://blogs.imf.org/2017/04/12/drivers-of-declining-labor-share-of-income/>. In particular: technology was significant before the 1990s (somewhat counterintuitively), trade consistently since the 1980s (though not as large as one might expect), the decline in the bargaining power of labour is more a mediating factor than cause, with the most significant cause by quite some margin being financialisation and the rise in dividend payments and retained income. Of course, all these factors are related: technological progress fuels global trade, and vice versa; the liberalisation of international capital flows from the 1980s has made financialisation possible; and so on. To think about policies to rebalance the share of income accruing to labour, the role of technology cannot be ignored. Lian, Dao, and Koczan, "Drivers of Declining Labor Share of Income."

184 Bengtsson, *Capital Shares and Income Inequality Evidence from the Long Run*.

185 Krugman, "Trade and Wages, Reconsidered"; Berger and Frey, "Structural Transformation in the OECD"; Olivier Blanchard and Francesco Giovazzi, "Macroeconomic Effects of Regulation and Deregulation in Goods and Labour Markets," IDEAS Working Paper Series from RePEc, 2001; Petra Dühnaupt, *The Effect of Financialization on Labor's Share of Income*, Working Paper 17 (Berlin: Institute for International Political Economy, 2013), [http://www.ipe-berlin.org/fileadmin/downloads/working\\_paper/ipe\\_working\\_paper\\_17.pdf](http://www.ipe-berlin.org/fileadmin/downloads/working_paper/ipe_working_paper_17.pdf).

Why has labour's share of national income declined? Recent IMF research has suggested that in developed economies, technological change accounts for about half of the decline in labour's share of national income.<sup>183</sup> That study suggests that technological progress beats globalisation as the main explanation for why workers have failed to benefit from the limited economic growth we have seen since the recession. The root cause for this is the concentration of technology 'capital' among the wealthy.

Other factors have played a part too. These include the uncoupling of wages and productivity. When real wages fall or stagnate but productivity rises, we would expect capital to receive an increasing share of national income, as is happening now. Also significant is the share of income received by the top 1 percent, which is closely correlated to the share of national income received by capital.<sup>184</sup> This implies that when the incomes of those at the very top rise rapidly, that income accrues as capital; over time, wage earners become capital owners; and since capital is distributed more unevenly than income, a rising share of income to capital will mean growing inequality over time.<sup>185</sup>

**“I suppose someone has to pay for ‘free delivery’ – just rather it wasn’t me”**

*Former Yodel Courier*

Falling levels of unionisation are likely to have contributed to income inequality. IMF research found that declines in rates of unionisation account for about 5 percent of the rise in the top 10 percent income share, and about half of the increase in the Gini coefficient of net income.<sup>186</sup>

Finally, recent research has shown that technology and globalisation may advantage the most productive firms within each industry. This produces market concentration and the domination of ‘superstar firms’, which in turn reduces the aggregate labour share.<sup>187</sup>

### **Why does the decoupling of productivity and wages matter?**

Over time, the gap between productivity and real wages has serious social consequences. It reduces the size of the economy overall, and it emphasises and exacerbates inequalities in the division of wealth.

If real wages had kept pace with productivity growth in the UK since 1990, the median worker would be 20% better off today.<sup>188</sup> The fall and then flat-lining of real wages has been particularly pronounced for younger workers, and workers in sectors like construction, health and social work.<sup>189</sup> This creates economic divisions and social tensions between different age groups and different groups of workers, as well as between businesses and those who work in them. These tensions will not simply resolve themselves.

The Financial Conduct Authority recently published results which found that 25.6 million people in the UK are potentially ‘financially vulnerable’. Many of these people were found to be vulnerable in part because of a lack of internet access or overdraft facility. Furthermore, 4.1 million people, mostly between the ages of 25 and 34, were considered to be in ‘serious financial difficulty’. The FCA pointed towards a growing ‘wealth gap’ in British society driving people, especially the young, towards consumer credit.<sup>190</sup>

Sluggish wage growth – and falling real wages – matters politically, as well as economically. From 1993 to 2005, in terms of market income, most people’s income in developed economies rose. From 2005 to 2017, incomes have fallen for all but the top 20% in France, 30% in the UK, 3% in Italy and 29% in the US. Falling incomes from work contribute to frustration and social alienation: the developed countries in which the growth in income from work has grown most slowly are also those which have delivered the greatest political shocks. The risk of waiting for the gap to close, may well be considerable social unrest.

This trend is an important illustration of this Commission’s argument. Technology is already shaping some of the most important labour market and economic trends – in this case, stagnant wage growth. This has already had social and political effects, but thus far, we have failed to connect the experiences of working people across the UK to the impact of technological changes. If we are to build a future of good work, we must make this connection explicit and begin to seriously address the economic changes that are most likely to be driving social and political discontent.

A trend like this raises important questions for the future. In terms of taxation, we must consider how we shift the balance of taxation from

<sup>186</sup> Florence Jaumotte and Carolina Osorio Buitron, “Finance & Development”, March 2015, Vol. 52, No1

<sup>187</sup> David Autor et al., “The Fall of the Labour Share and the Rise of Superstar Firms,” MIT Economics, 2017, <https://economics.mit.edu/files/12979>.

<sup>188</sup> Andrew Haldane, “Labour’s Share” (Speech, Trades Union Congress, November 12, 2015), <http://www.bankofengland.co.uk/publications/Pages/speeches/2015/864.aspx>.

<sup>189</sup> *Ibid.*

<sup>190</sup> FCA, *Understanding the financial lives of UK adults: Findings from the FCA’s Financial Lives Survey 2017*, October 2017, <https://www.fca.org.uk/publications/research/understanding-financial-lives-uk-adults>



income to capital, without discouraging investment. If we are to share the benefits of technological change, increases in productivity must accrue to labour as well as capital. More broadly, we must consider how we can ensure that our economy does not become further characterised by a distinction between ‘superstar’ firms and the rest.

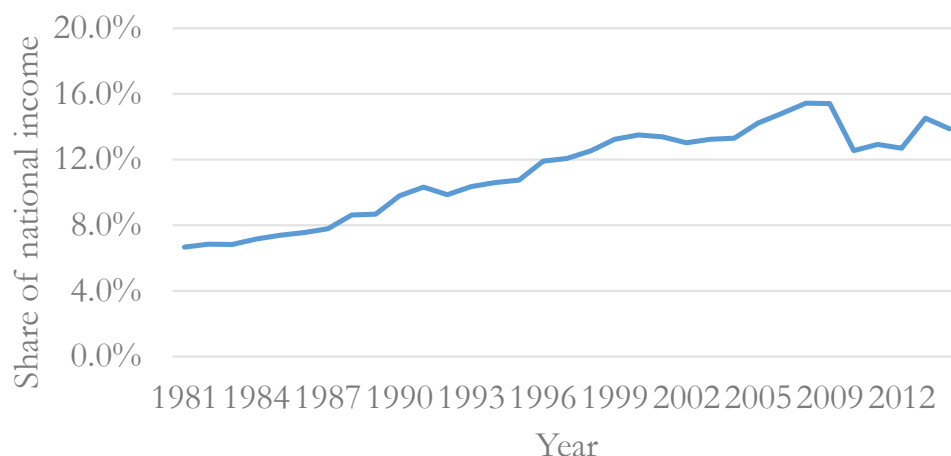
We must act now, both to jumpstart productivity growth in the UK, and to recouple growth in wages to growth in productivity. We set out some of our recommendations as to how to address these structural issues in Chapter 3 of this report.

### Inequality

The uncoupling of productivity and wages, (as well as other trends, such as the decreasing share of national income that accrues to labour) has contributed to growing inequality. Technology-driven change is likely to reinforce the gap between low-skill service sector jobs and the kinds of work that are available to workers in high-productivity firms.

The evidence we have examined supports this view. On most measures, income inequality rose considerably in the UK in the 1980s, and the share of household income accrued by the top 1% has increased considerably since then.

SHARE OF NATIONAL INCOME TO TOP 1 PERCENT IN UK, 1980 - 2014 <sup>191</sup>



Source: World Wealth Database

Inequality is rising in most OECD countries, but the UK has seen levels well above the OECD average for the last three decades, a trend exacerbated by the concentration of wealth at the top during the financial crisis.

The October 2017 data published by the ONS shows that average household income per person has fallen again in each of the last four quarters so that annual income per person is estimated to be 2.3% lower than it was a year ago. This makes household income per person no more than 5% higher than it was a decade ago and has pushed real earnings growth into negative territory. The income of the top 1% has continued to rise.<sup>192 193</sup>

As noted above, technological change is likely to have contributed to this increase in income inequality, in the UK as in other countries. A recent Obama White House report linked the rising share of income

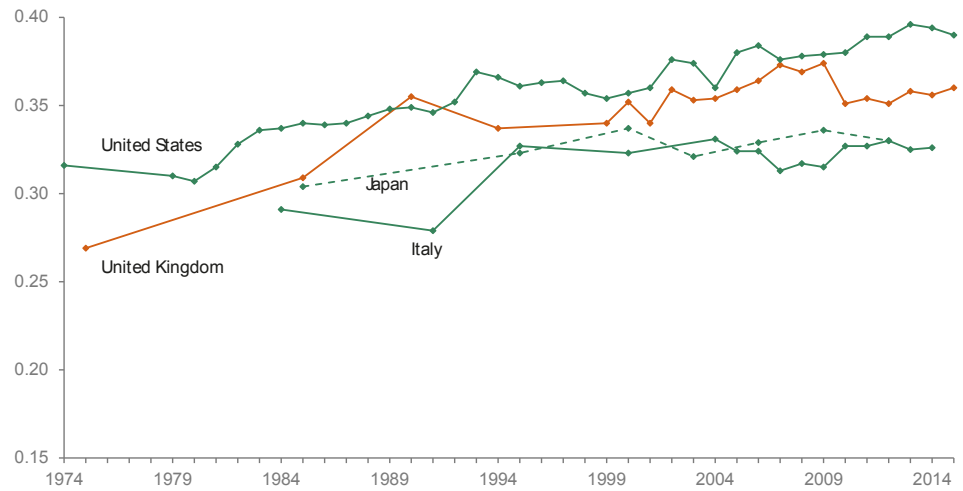
<sup>191</sup> The Gini coefficient measures inequality across the values of a 'frequency distribution', in this case levels of income. It measures the income or wealth distribution of a country's residents.

<sup>192</sup> Resolution Foundation, Living Standards Audit, July 2017, <http://www.resolutionfoundation.org/app/uploads/2017/07/The-Living-Standards-Audit-2017-FINAL.pdf>

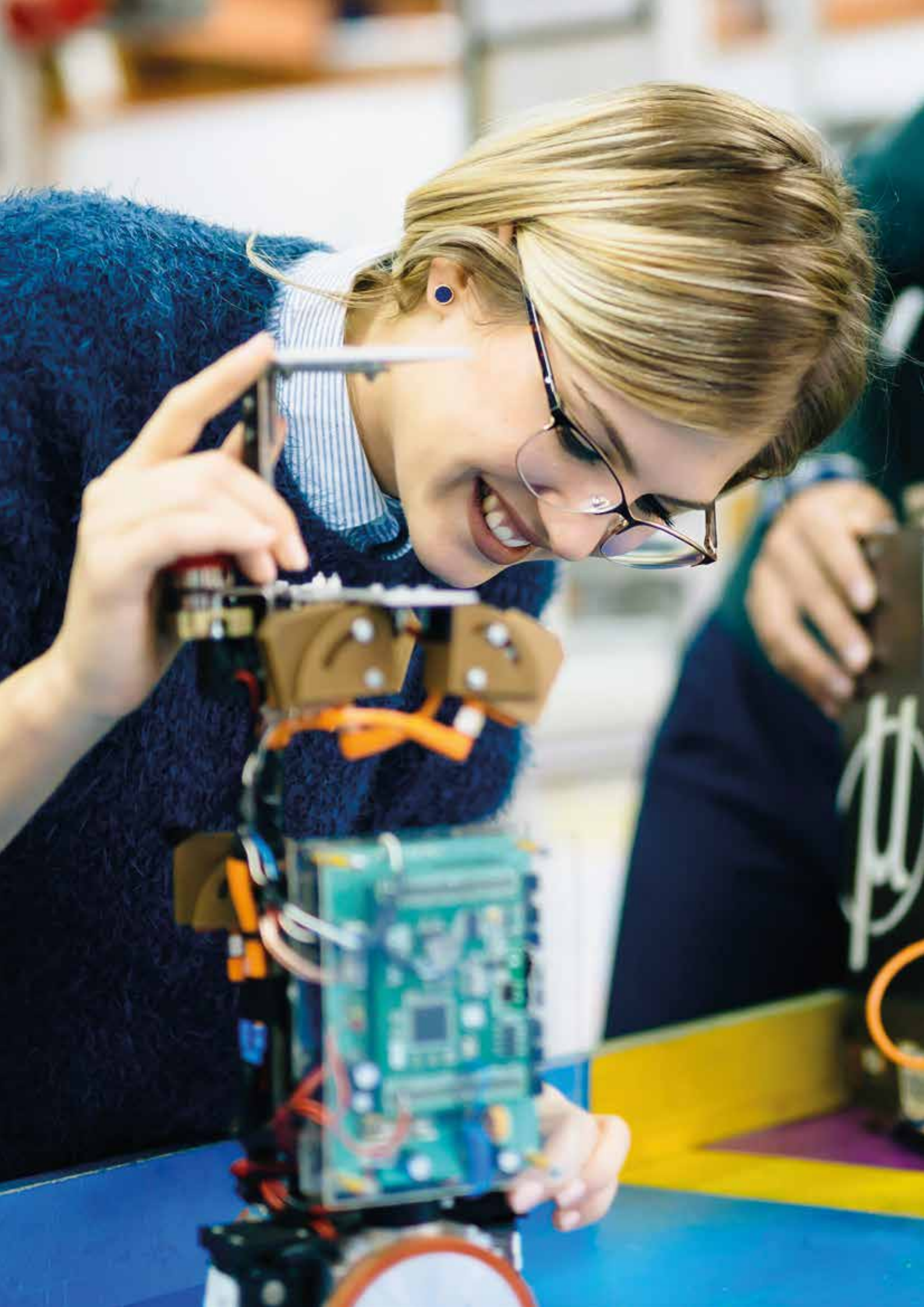


of the top 0.01 % (and 0.1 and 1%) of earners with 'superstar-biased technological change', in which the benefits of technology accrue to an even smaller portion of society than just highly-skilled workers.

### INCOME INEQUALITY, SELECTED COUNTRIES 1974 -2015



We believe that, without a clear sighted and bold policy response, technological change will continue to contribute to increasing income inequality. As those with the least education and the lowest levels of skills feel the impact of automation, technological change is likely to drive wages down for the most vulnerable. At the same time, technological innovation will offer opportunities to the highly-skilled (and wealthy) to secure an even greater proportion of the national income. Without appropriate intervention from governments, businesses, trade unions and workers, the benefits of technological innovation are set to be enjoyed by a comparatively narrow few. Our suggested reforms to address these persistent inequalities and promote equality and inclusion through technological changes to work are set out in Chapter 3 below.



## CHAPTER 3: OUR RECOMMENDATIONS

In Chapter 1, we explored what ‘good’ work means and identified our foundational principles.

In Chapter 2, we outlined the major social and economic challenges, many driven by technological change, which we must address if we are to turn this ambition into reality.

In this chapter, we set out how we can begin to achieve this goal. Our overriding aim is to take full advantage of technological change, to spread its benefits and secure a future that is fair, prosperous and built around the central importance of good work.

The scope and scale of our provisional recommendations is ambitious. They cover a broad spectrum of policy domains that relate to work. We believe that, to implement our principles and generate good, fairly-paid work for all citizens, we must rethink some of the assumptions and pillars on which our social and economic institutions are built.<sup>194</sup>

Our recommendations reflect our ethos of co-operation. Only by encouraging people and our major social and economic institutions to cooperate more closely, to work together for our shared ambition of a future of good work, can we realise our goals.

Our recommendations are designed to support each other. We have grouped them into six focus areas:

- **Prioritising Good Work**
- **Skills for the Future**
- **Promoting Innovation**
- **New Models: Corporate Governance and Alternative Ownership**
- **Labour rights and standards**
- **Ethics**

<sup>194</sup> There are many types of institution. ‘Institutions’ include major organisations and infrastructures, employment regulation, corporate governance and codes, schools and universities, as well as cultural institutions, norms and practice.



## PRIORITISING GOOD WORK

The centrality of work to our lives, families and communities, as well as to building an inclusive economy, has led us to conclude that we should put the creation of good work at the heart of our agenda, guiding policy-making across government.

Work must offer security, dignity, and autonomy, and it must be available to everyone – in terms of access, but also in terms of continuing opportunity and progression throughout a working life. These are our foundational principles of good work.

We think mutual recognition of these values will make a significant contribution to a sense of everyday citizenship – where people have freedom and respect in, and control over, their working lives.

Work also matters from a sharper economic perspective: jobs connect national economic growth to a family's living standards. Work is therefore the most obvious route to improve income and increase living standards more broadly, by sharing the benefits of technological innovation. The latest Labour Force survey<sup>195</sup> shows that the number of people in work has increased once again, but real income growth has once again slowed over the last year, with weakest growth for those with the lowest incomes.<sup>196</sup> The problem we face is not the number of jobs, but their quality and pay.

Our reasoning from these different social, cultural and economic perspectives converges: generating good, fairly paid work for our citizens is the best way to seize new opportunities and share benefits. We need to harness the potential of technology to increase productivity, wages and work quality together.

So public policy should have a new, simple ambition: to achieve the social and economic conditions which create and secure good, fairly paid work. Governments should plan and make policy with this goal in mind, rather than allow the unintended consequences of other policy decisions to shape the future of work in Britain.

### A Charter of good work

The first step is our first recommendation: the government should draw up a new Charter for Good Work, to highlight and protect the basic components of good work for citizens. The Charter should assert the government's commitment to building a future of good work as a central objective of its social and macroeconomic policy. It should provide an organising national framework around this commitment and encourage fresh thinking about how to achieve this goal through the technological revolution.<sup>197</sup> We think the Charter is particularly important because of the uncertainty of existing labour protection derived from EU law and the future of the British Human Rights Act.<sup>198</sup> It supports both, and does not substitute for either.

The Charter would not contain legally enforceable rights, although it may result in improvements to regulation. It would set out *guiding* principles for government, and identify the *social* rights which people need to promote good, fairly-paid work. The Charter is built from the foundational principles set out in Part 1.<sup>199</sup>

<sup>195</sup> September ONS analysis of Labour Force Survey for May- July 2017. There are 32.14M people in work, which is 379,000 more than a year earlier. Comparable record started in 1971.

<sup>196</sup> Resolution Foundation Annual Living Standards Audit, July 2017, <http://www.resolutionfoundation.org/publications/the-living-standards-audit-2017/>

<sup>197</sup> The Taylor review concludes that a 'national framework around an explicit commitment to good work for all' is necessary. Matthew Taylor et al., "Good Work: The Taylor Review of Modern Working Practices," 2017, [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/627671/good-work-taylor-review-modern-working-practices-rg.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/627671/good-work-taylor-review-modern-working-practices-rg.pdf).

<sup>198</sup> The Charter of Fundamental Rights also need express protection to endure Britain leaving the E.U.

<sup>199</sup> Ref ESC Art 1: The Charter should not be controversial. The UK already signed up to these rights, or variations of these rights, in international law, and the Charter is consistent with the recommendations of the Taylor Review too.



A 'good work' objective should be written into existing government policies, standards and codes, with reference to the Charter. Government departments would then produce their own action points which set out how they will achieve this objective.

### **DRAFT CHARTER FOR GOOD WORK**

Public policy should aim to create the social and economic conditions in which the following principles – the basic components of good fairly-paid work – are effectively realised:

1. Everyone should have an equal opportunity to earn their living in an occupation into which they enter freely and without discrimination.
2. All workers should receive fair remuneration.
3. All workers should have working conditions that respect their dignity.
4. All workers should have working conditions that respect their autonomy.
5. All workers should have safe working conditions which protect physical and mental wellbeing.
6. All workers should have an effective and enforceable right to freedom of association.
7. All workers should have access to bodies which represent their interests, and institutions to enable them to exercise their rights and enjoy social protection at work.
8. Everyone should have facilities for vocational training.
9. All workers should have the right to participate in improving their working conditions.
10. Everyone should have the right to the protection, control and use of their personal data.

We intend to consult widely on the content and implementation of the Charter.

### **Futures Unit, Chief Officer and Service**

There is no community of AI expertise in government. Britain's civil service is world-class, but government must prioritise and co-ordinate public policy which shapes the use of technological innovations in public work and services. So we recommend the establishment of a Futures Unit. This would be a cross-Whitehall senior-level body, whose remit would be to identify and respond to the new opportunities and challenges of the technological revolution and hardwire standards in the testing and use of AI and related technologies across government. The Futures Unit would be headed by a Chief Futures Officer.



This Futures Unit would work constructively with industry and academic partners to keep abreast of new developments and predictions, monitor standards and assess the impact of, and scope for, improvements across government.<sup>200</sup> It would lead in piloting innovative applications of the latest technologies,<sup>201</sup> and would advise the government on direct government investment in technology and science-related enterprise. The Futures Unit would be prepared to experiment, and would have the expertise do so.

We note that there is a very high level of support for improved use of technology and better practice across the civil service,<sup>202</sup> as well as leaders in industry and academia.<sup>203</sup> This is not surprising: we think that the scope for improvement, consistency and long-term cost savings in public work and services is considerable.

Alongside the unit, a Futures Service should be established to train fast stream civil servants in AI and related technologies, drawing on the precedent of the Government Economic Service. This should lead to an AI-based transformation of how public-sector institutions and employees get work done.<sup>204</sup>

### A British White Paper Work 4.0

Aided by the Futures Unit, government should initiate the British equivalent of the German White Paper, 'Work 4.0', to devise a comprehensive national strategy to prepare for the future of work in the context of the technological revolution.<sup>205</sup> As in the German White Paper, trade unions, companies and other stakeholders should be involved in planning, and the goal of generating good work should be central to this initiative.<sup>206</sup> The strategy could develop and add to the recommendations we make below.

### Mandatory AI Strategy reports

The approach to AI and related technologies in the public sector is haphazard. We think that all public sector departments and relevant bodies should be required to develop AI strategies and submit annual reports to the Futures Unit demonstrating how they had considered use of AI-related technology to undertake their work and services. The reports should be available to the public too. Mandatory reporting would focus departments on the opportunities and challenges presented by AI and related technologies, reveal weaknesses, scope for improvement and potential cost savings.

### Procurement to support the future of good work

We recommend that the Futures Unit devise Guidance on the Intelligent Use of Technology for use cross-department in considering how to procure services. The Guidance should require some level of consideration and assessment of the impact, use and potential use of new technology to improve both services and the quality of work for those involved.

We note that the SBRI research at Innovate UK show a falling level of government contracts to smaller high-tech start-ups. Good work in Britain is more likely to be generated by a small number of high-tech British SMEs and clusters of SMEs performing government

200 We note TechUK's recommendation that, to take advantage of developments in data analytics and artificial intelligence, the British civil service needs to be more flexible in its working practices, and design services more iteratively as new information about users becomes available. TechUK, *Smarter Services Delivering the Next Wave of Digital Transformation in the Public Sector*, 2017, [https://www.techuk.org/images/smarter\\_services\\_DIGITAL\\_FINAL.pdf](https://www.techuk.org/images/smarter_services_DIGITAL_FINAL.pdf)

201 Note Tech UK and Institute recommend more experimentation. Locate refs

202 In their survey of 948 civil servants, TechUK discovered that 97% thought that technology was a necessity or an enabler for their business operations; 93% thought that public services improved by sharing more information and processes between departments and organisations. TechUK, *Smarter Services Delivering the Next Wave of Digital Transformation in the Public Sector*, 2017, [https://www.techuk.org/images/smarter\\_services\\_DIGITAL\\_FINAL.pdf](https://www.techuk.org/images/smarter_services_DIGITAL_FINAL.pdf)

203 AI Industry review chaired by Dame Wendy Hall released 15 October 2017

204 We note the Deloitte US study on 'How AI could transform government' which suggests billions of dollars could be saved through the use of AI in government, <https://www2.deloitte.com/uk/en/pages/public-sector/articles/artificial-intelligence-in-government.html>. We would welcome a comparable study on the UK. The report expects that 'AI-based technology [will] fundamentally transform how public sector employees get jobs done – eliminating some jobs, redesigning others and creating entirely new professions.'

205 Federal Ministry of Labour and Social Affairs, 'Re-imagining Work: White Paper 4.0, November 2016, <http://www.bmas.de/EN/Services/Publications/a883-white-paper.html>; White House, 'Artificial Intelligence, Automation, and the Economy', December 2016, <https://obamawhitehouse.archives.gov/sites/whitehouse.gov/files/documents/Artificial-Intelligence-Automation-Economy.PDF>

206 TUC, 'Shaping Our Digital Future', September 2017, <https://www.tuc.org.uk/sites/default/files/Shaping-our-digital-future.pdf>



procurement services. We think that Guidance on Use of Technology should aim to increase the number of high-tech SMEs undertaking government procurement work.

### Mandate for the Bank of England

Our foundational principles and goal invite re-evaluation of the roles of major national institutions which are relevant to our shared ambition of building a future of good work in Britain. This includes the Bank of England.

The Monetary Policy Committee's objective is to deliver price stability and set interest rates. Secondary considerations – support for growth and employment<sup>207</sup> – only kick in if the primary objective of price stability has been achieved.<sup>208</sup> This means that the Bank of England has a duty to prioritise inflation and price stability above other macro-economic goals. It also means that the Bank cannot consider inequality.<sup>209</sup>

It is important that the Bank of England can set monetary policy independently from government. But we think this principle of independence should not inhibit an open and informed debate about national priorities and a possible update to the Bank's mandate to ensure the Bank has a remit and levers fit for the technological revolution.

Mandates for national independent Banks differ around the world. Many have economic objectives<sup>210</sup> which are broader than the Bank of England's. Different remits include Canada's (to "promote to the economic and financial welfare of Canada"<sup>211</sup>) and the US's ("to promote maximum employment, stable prices, and moderate long-term interest rates in the U.S. economy").<sup>212</sup>

We do not yet have enough information to recommend a specific broadening the Bank's remit, but we think this is worthy of careful consideration. So we recommend a public debate on updating the remit of the Bank of England mandate to allow the Bank to carry out a balancing act between inflation, price stability and wage growth – to help increase growth and reduce inequality in the longer-term. It would allow the Bank to consider the availability and cost of credit to invest in new technology. We think this may help harness technological innovation to spread prosperity among and promote good work for British citizens.<sup>213</sup>

### Direct Government Investment

We believe that government should take a bolder, more entrepreneurial role involving new types of direct government investment. This is an important part of seizing the opportunities of the technological revolution, shaping new markets and creating good work. In particular, the state should consider risk-sharing and boosting direct public-private collaborations with a focus on scaling up British SMEs, which are most likely to generate good work for citizens in national growth areas. This should catalyse private investment too.

The Chief Futures Officer which we have recommended could advise the government on technology and science-related investment in

207 'Budget 2013: Chancellor's Statement', <https://www.gov.uk/government/speeches/budget-2013-chancellors-statement>

208 "The Bank's monetary policy objective is to deliver price stability – low inflation – and, subject to that, to support the Government's economic objectives including those for growth and employment. Price stability is defined by the Government's inflation target of 2%", <http://www.bankofengland.co.uk/monetarypolicy/Pages/framework/framework.aspx>

209 The Treasury Committee, public and other stakeholders have not yet had an opportunity to debate this important topic.

210 For example, the US Federal Reserve has duties to maximize employment, stabilize prices and achieve moderate long-term interest rates; the Canadian Central Bank's objectives are to promote the economic and financial welfare of Canada; and the European Central Bank

211 <http://www.bankofcanada.ca/about/>

212 'Overview of the Federal Reserve System', <https://www.federalreserve.gov/aboutthefed/pf.htm>

213 This Commission note the similar recommendation concerning the Bank's remit made by the Commission on Economic Justice [https://ippr.org/files/2017-09/1504617046\\_cej-interim-report-summary-september2017.pdf](https://ippr.org/files/2017-09/1504617046_cej-interim-report-summary-september2017.pdf)

## CASE STUDY: THE GERMAN FEDERAL MINISTRY OF LABOUR AND SOCIAL AFFAIRS

The German Federal Ministry of Labour and Social Affairs coordinated a broad public dialogue with social partners, associations, businesses, academia and members of the public on the future of what it called 'Work 4.0' in Germany. The primary goal was to consider the impact of digitalisation on employment and the quality of work. The questions posed included these: 'the working world of the future will be different from today's. Will it also be better? Will we work in a more self-determined and healthy way? Will we learn a new occupation at 50? Are machines taking away our work or are they paving the way for innovations and productivity gains which create new jobs?'

underserved opportunities, and options to obtain revenue, royalties, equity or other benefits from its increased investment.

We recommend further research and consideration is given to the following forms of direct investment aimed to support the innovation ecosystem which underpins growth and good work.

- **Ring-fencing and boosting place-based government venture capital funds** targeted at SMEs in anticipated growth areas most likely to scale-up and create jobs.
- **Expanding low-interest loan and grant schemes** for scale-up as well as start-up enterprises. The prospects for local good job creation and partnerships should be included in the criteria for applicants for government investment.<sup>214</sup>
- **Increasing the spread of national Innovation Challenges**, starting with increasing the size and scope of Innovate UK's Robotics and A.I. Industrial Strategy challenge fund. Again, the focus should be national growth or anticipated growth areas most likely to scale up and create jobs. Like InnovationRCA's Future of Work challenge, Our Place in the World,<sup>215</sup> these could be aimed at Future Work problem-solving missions.
- **Devising ambitious, private-public contracts** based on a sharper awareness of both the value and use of public data-sets. This would ensure government got better value from software and other technology, which is currently often developed from access to uncontroversial public data-sets, but in which the economic value is received by private sector organisations rather than being harnessed for the public good. The value of public data-sets, and use of software developed from these data-sets, should be reflected down supply chains.
- Alongside this, the Treasury should develop **innovative, blended financial instruments** which allow government to take a low level of royalties or equity from its increased investment. This may include place-based grants, guarantees, low-interest loans and blended financial instruments focused on underserved investment opportunities and accelerating the scale-up of those firms most likely to generate good work in Britain. Investment could be made either directly or via independent arms, such as Innovate UK.

<sup>214</sup> The Chief Scientist in Israel has \$550 million of state funds to invest each year as debt to be repaid by royalties of around 3% of successful company sales.

<sup>215</sup> A social innovation challenge set up by the Royal College of Art in partnership with philanthropist Tom Shutes, launched by Tom Watson MP in October 2016



**“At the moment the onus is on the individual to make a case based on their circumstances and needs. We know that members have all too often been asked to explain in detail their personal circumstances in order to ‘persuade’ their employer to agree their request. For many the choice they are left with is to work the hours that don’t suit them or not at all.”** <sup>220</sup>

*USDAW Equalities Officer*

### The future of equal opportunities

Government has an important role to play, alongside business, to support a diverse workforce and help more people engage in the labour market. In Britain, we have stubborn gender, race and disability pay gaps<sup>216</sup>: the gender pay gap stands at 18.1%<sup>217</sup>, the ethnicity pay gap at 5.7%<sup>218</sup> and the disability pay gap at 13.6%.<sup>219</sup> Women are most likely to be overrepresented in retail, hospitality and social care, which are growing low pay sectors.

As we have emphasised in this report, technology can either exacerbate or reduce discrimination at work. The effect it has will depend on what choices we make. AI could learn and reinforce existing biases to perpetuate past patterns of disadvantage in ways that are not immediately obvious. But AI and related technologies could also be used to help understand, devise and deliver practical solutions to promote equal access to good work.

We recommend that Government should use and accelerate policy instruments to achieve a more diverse work force:

- **Uniform pay gap reporting.**<sup>221</sup> Government, business and trade unions should use technology for advanced monitoring and investigations into pay gaps and diversity in job-seeking and progression at work. Stakeholders should work towards uniform pay gap reporting with a view to eliminating pay gaps.
- **Promoting STEAM pathways.** Girls and women are under-represented in STEM-related careers, which tend to offer higher levels of work quality and pay. But we think creativity will matter in the future digital economy, and pupils should not be asked to choose between being an ‘arts’ or ‘science and technology’ specialist. So “STEAM” pathways in which students can study Science, Technology, Engineering, Arts and Maths to a high level should be promoted at all levels of education. School timetabling that pits arts subjects against STEM subjects should stop; the number of underrepresented and protected groups in STEM-related apprenticeships should be increased;<sup>222</sup> and we must address the lack of diversity in AI communities and tech sectors themselves.
- **Flexible working.** Stakeholders should work together using technology to explore and promote options for different types of part-time, flexible and remote working. This would support our new labour right on flexible working.
- **Job-seeking.** AI-related technology should be applied to **improve job-matching** and job-seeking services for groups most disadvantaged by workplace structures.
- **Supporting disabled workers.** Technology can be used to support greater autonomy and potential for the 6 million working disabled people through enabling technologies such as speech control, screen reading, and touch screens.

<sup>216</sup> Equality and Human Rights Commission, *Fair opportunities for all A strategy to reduce pay gaps in Britain, August 2017*, <https://www.equalityhumanrights.com/sites/default/files/pay-gaps-strategy-fair-opportunities-for-all.pdf>

<sup>217</sup> <http://visual.ons.gov.uk/the-gender-pay-gap-what-is-it-and-what-affects-it/>

<sup>218</sup> Longhi, S. and Brynin, M. (2017), ‘The ethnicity pay gap’. Equality and Human Rights Commission (EHRC)

<sup>219</sup> Longhi, S. (2017), ‘The disability pay gap’. Equality and Human Rights Commission (EHRC)

<sup>220</sup> Evidence to the Commission by Unltd

<sup>221</sup> As recommended by the Equality and Human Rights Commission. *Equality and Human Rights Commission, Fair opportunities for all: A strategy to reduce pay gaps in Britain, August 2017*, <https://www.equalityhumanrights.com/sites/default/files/pay-gaps-strategy-fair-opportunities-for-all.pdf>

<sup>222</sup> See Equalities action plan For Modern Apprenticeships in Scotland, [https://www.skillsdevelopmentscotland.co.uk/media/40691/2869\\_sds\\_equalities\\_action\\_plan\\_digital\\_v7.pdf](https://www.skillsdevelopmentscotland.co.uk/media/40691/2869_sds_equalities_action_plan_digital_v7.pdf)



- **Ethics and algorithm training** should be compulsory for those involved in the process of production of AI-related technologies. It must cover the potential for algorithmic bias, monitoring and impact of diversity. The Equality and Human Rights Commission should be consulted on developing a training programme.
- **The Equality Act 2010 should be extended** to allow a right to understand the basis for algorithmic decision-making in the supply of goods and services and in making decisions as to whom to select for work, and to prohibit discrimination in decision-making on the basis of unjustified characteristics in algorithms in these sectors. **Public and new private sector equality duties.** Technology should enable advanced monitoring and review of these duties and support the development of best practice guidance.

### Understanding and measuring change

Good government demands the best and most accurate data on changes to the labour market to inform predictions and policy development.<sup>223</sup> We have been struck by the inadequacy of sectoral data and analysis outside the work of our own Commissioners. As a Commission, we have tried to obtain new data sources relevant to understanding the impact of technology in more granular detail. We hope this seed will grow: the detail and precision of our national response should be informed by the best data and analysis possible.

Government, the Bank of England, businesses and trade unions should work together to generate a constant stream of higher quality data and analysis about changes to the labour market, and the impact of introducing new technology.

We need new and better measurements to map change. These must include job quality: job quality should become a priority in the way we measure, respond to and think about disruption. We recommend that the government measure good work by using the OECD's job quality index as set out in Chapter 1. Government and all stakeholders should consider how we can build on and improve this index and other measurements of good work. This should provide us with a new measure of our economic progress – and our progress as a society.

We also recommend the remit and activities of the Office of National Statistics and National Audit Office are expanded as centres of data gathering and impact assessment to better inform understanding of, and a collaborative response towards, the changes we have outlined above. New data sources should be sought and combined using a variety of different methods and technologies. Initial work could include:

- **Extending the Labour Force Survey** to collect task level data about occupations and measuring income and working hours of all employees, including the self-employed and whether job status is a choice
- **Extending the Annual Business Survey** to quantify the adoption, barriers and impact of new technology at a firm level
- **Introduce national statistics on pay gaps**, including ethnicity and age, as well as gender

<sup>223</sup> Hasan Bakhshi Jonathan M. Downing Michael A. Osborne Philippe Schneider, 'The Future Skills of Employment 2030' (Pearson and Nesta, 2017), [https://www.nesta.org.uk/sites/default/files/the\\_future\\_of\\_skills\\_employment\\_in\\_2030\\_0.pdf](https://www.nesta.org.uk/sites/default/files/the_future_of_skills_employment_in_2030_0.pdf).



- **Create a central dashboard** to combine data sources and analyses and support easy-access to the most up to date information on labour market trends available to everyone

### A capital tax review

Britain can seize the opportunities of the technological revolution and become one of the most innovative, dynamic market economies in the world. But first we need to confront the ‘elephant in the room’: the need for a review of the taxation of capital.

We need to confront the evidence we have outlined about the changing returns to capital and labour, and how best to spread the benefits of new technology.<sup>224</sup> The labour share of income is falling; the capital share of income continues to rise. Because of the trend towards consolidation, in the technology sector in particular, the gains of the technological revolution tend to stick to an increasingly small number of companies and individuals who own or control the machines and ‘capital’.

We think there is a real need to review the UK’s approach to capital taxation to make sure that it is fit for purpose in the age of technology. The review should cover use of the tax code to restore the relationship between wage increases and productivity. The IMF’s fiscal monitor in October 2017 called for higher taxes for the top 1 percent of earners to reduce inequality, suggesting the time is right for a capital tax review.<sup>225</sup>

We do not recommend the introduction of a so-called ‘robot’ tax.<sup>226</sup> We believe this would disincentivise the introduction of enabling technology, which is a prerequisite to boosting productivity and wages in the future. The capital tax review we propose should consider how alternative options might affect investment in new technology; a principle of the review should be that it would not clash with incentives aimed at the introduction of new technology.

## SKILLS FOR THE FUTURE

In Chapter Two, we explained that occupations and tasks within jobs across almost all sectors will transform, and new sectors will emerge. To ensure that all citizens have access to work that is secure and offers autonomy over the duration of their life, workers of all skill levels will need to retrain with greater frequency and speed than ever before through multiple career cycles. Technological progress thus demands a much higher and more focused level of investment in skills – this is a challenge not just for the future, but for the present.

British working people will need transferable skills that are oriented towards the future, to make sure that new opportunities are equally accessible, and no one is left without the skills to participate in twenty-first-century labour markets. We think that creative, non-cognitive, social and critical thinking will drive the creative use of technology and therefore growth, and the creation of good jobs. Human creativity lies at the heart of skills for future work and a fulfilling work life too.

Life-long learning will be essential to this transition. A package to support learning while earning will be a crucial part of reaching the long

<sup>224</sup> See ‘Labour’s Share’ in Part Two. Andrew Haldane, ‘Labour’s Share’ (Speech, Trades Union Congress, November 12, 2015), <http://www.bankofengland.co.uk/publications/Pages/speeches/2015/864.aspx>

<sup>225</sup> As discussed in Part Two, research by the Bank of England shows that in the last two decades, labour’s share in the UK has begun to decline quite rapidly, and particularly in the last decade or so since the economic crisis. Recent IMF research has suggested that in developed economies, technological change accounts for about half of the decline in labour’s share of national income.

<sup>226</sup> Richard Waters, ‘Bill Gates calls for an income tax on robots’, *Financial Times*, February 19 2017, <https://www.ft.com/content/d04a89c2-f6c8-11e6-9516-2d969e0d3b65>

**“I think the social aspects and wider role of education cannot be replaced by a machine. But technology is a useful tool we could use in the classroom.”**

*Laura,  
languages teacher*

tail of low-tech, lower-productivity workers trapped at the bottom end of skills distribution, and should reduce the division between the few who are already benefiting from the technological revolution, and the rest. It should support progression too.

Our research suggests that working people are troubled by the absence or poor quality of training to support their use of new technology at work. 49% of respondents in our USDAW survey felt, or felt strongly, that they had not had adequate training. 55% of respondents to our YouGov survey were not confident that they would be properly supported by the Government in learning new skills related to changes in their role. We agree. This must change.

### Future skills at school

To prepare our children for the future of work, and give everyone the opportunity to benefit from the technological revolution, we recommend:

- **Prioritising creativity**, interpersonal and problem-solving skills within the school curriculum. A new ‘**preparedness for work**’ objective in the national curriculum should be drawn up with the input of business leaders, economists, psychologists and educational experts to ensure that creative subjects feature alongside computer science and data literacies as core competences.
- **Data literacy and computer science** will be required for much of the work in future labour markets, and will support informed and active citizenship in a society increasingly dependent on data use and algorithms. Every child should have access to computer science and digital education, including some understanding of AI, alongside arts education.<sup>227</sup>
- **AI education.** A specific AI curriculum could be developed in secondary schools.<sup>228</sup> AI-focused vocational, graduate, postgraduate and conversion courses should be introduced and made available to people without a background in STEM subjects. Ethics training should be part of AI training.
- **Piloting.** AI and related technology should be piloted in schools and other institutions to support staff, enhance individual learning and assessment, and build virtual communities outside the school walls. AI technologies can be used to assist teachers in providing more creative, individualised learning programmes.
- **Exams.** Creative use of AI should be used to experiment with new types of assessment for pupils that avoid rote learning and the traditional format of exams. The EBacc should be revised as a performance measure in schools to make sure that creative subjects are prioritised and valued alongside STEM core subjects.<sup>229</sup>
- **Networked** use of A.I. in classrooms can support peer to peer learning in new regional, national and international communities outside the school walls, sharing best practice and helping to break down barriers.

<sup>227</sup> Hasan Bakhshi Jonathan M. Downing Michael A. Osborne Philippe Schneider, ‘The Future Skills of Employment 2030’ (Pearson and Nesta, 2017), [https://www.nesta.org.uk/sites/default/files/the\\_future\\_of\\_skills\\_employment\\_in\\_2030\\_0.pdf](https://www.nesta.org.uk/sites/default/files/the_future_of_skills_employment_in_2030_0.pdf)

<sup>228</sup> As recommended by VYY in Finland in June 2017

<sup>229</sup> Acting Up Report: Labour’s inquiry into access and diversity in the performing arts, August 2017, <http://www.tom-watson.com/actingup>

**We need teachers to “support students and build rapport”, it just wouldn’t be “the same relationship with a robot.”**

*Nahi Ahmed,  
Pupil in Dagenham*

**Future Work life-long learning account**

We recommend that the government should establish a universal Future Work life-long learning account to make the principle of life-long learning a reality. The programme should be tripartite to reflect shared responsibilities: government, employers and individuals should pay into, and continue to support, the account in a variety of different ways, including credits and training. It should closely match changing labour market demands.

The programme could be used over a working lifetime in ways chosen by the individual including, for example, re-training, career breaks or setting up a business. The Unionlearn programme run by the TUC and new Scottish Individual Learning Accounts are helpful precedents, reflecting shared interests and responsibilities. We note the reports and submissions from IPPR and the RSA on the value of personal learning accounts, and the RSA survey which suggests that 44% of business leaders support prioritizing vocational education and life-long learning.

The credits given for certain types of training could be increased or decreased in line with changing sectoral needs and the advice given by sectoral councils: the programme should be developed to be respond to current and anticipated needs and priorities in the labour market. Options could be selected at times of need over a life-time of work.

Life-long learning is important, and difficult to get right. We therefore recommend:

- **Pilots.** The government should provide funding support for work with educational institutions, local businesses, trade unions and workers to work together in key sectors to pilot appropriate Future Work Accounts
- **Accredited providers.** Courses should be run by a diverse range of accredited providers including Union learn, WEA and the Open University.
- **Vulnerable sectors.** The programme should be trialled in sectors and in regions most vulnerable to automation as part of the support for displaced workers.
- **Employers** should be able to provide input into a diverse range of accredited courses and activities aimed at supporting growth and responding to labour market needs. Incentives and credits should be offered to employers for early support of Future Work Accounts pilots and the design of in-house skills programmes that go beyond immediate business needs.<sup>230</sup>

## “Innovation is a core British strength – we must build on this to generate new and fulfilling work for our citizens.”

Naomi Climer,  
Commissioner

- **Technical learning trusts**,<sup>231</sup> linking the tiers of technical education around a future skills lead, could co-ordinate and advise on Future Skills programmes and advise on Future Work accounts.

### Support for job seekers

We need new, accessible mechanisms for job-seeking and careers guidance, which respond to changing labour market demands, increasingly divisible work and multiple career cycles.<sup>232</sup> Many British workers are overqualified and are not using their skills.<sup>233</sup> Identifying the right future skills is only half the battle. The proportion of public expenditure on active labour market policies in Britain is low and decreasing – we are moving in the wrong direction.<sup>234</sup>

We recommend using a range of policy instruments to support more advanced, active support for jobseekers to help everyone find good work:

- **Sanctions regime.** We recommend the review and reform of the sanctions regime for jobseekers if it is found to be driving down pay in some sectors, encouraging the growth of zero-hours contracts, or discouraging innovation and re-skilling.
- **Using AI related technology.** AI-related technology should be used to develop and apply more extensive and tailored job-matching services. Job Centres should be equipped with better technology, including new tools for web-scraping, to increase the volume and quality of job searches to understand local demands, and help individuals make informed choices. This should help redress the split between over-qualification and skills deficits.
- **Jobcentres** should be given specific, additional remits to help to support new self-employed workers; part-time workers; and proposed changes to career paths.
- **Diversity.** Jobcentres should give regard to the potential for technology to support job-seekers furthest from the job market, for example remote working for carers, disabled people and older workers

### PROMOTING INNOVATION

Britain is a nation of entrepreneurs.<sup>235</sup> However, as we explained in Chapter 2, the full potential of technological change has not been realised: the pace of productivity growth in the UK has so far remained sluggish, at 13 % below the G7 average.<sup>236</sup>

The evidence we have seen suggests that the single biggest problem for growth – and the potential to create good work – is a low level of investment in physical and human capital.<sup>237</sup> These are the central pillars which support innovation. The majority of respondents in our survey support or strongly support increasing levels of investment in technology<sup>238</sup> to seize new opportunities offered by the technological revolution. We agree, and make three central suggestions as to how to promote innovation in Britain.

<sup>231</sup> Commission evidence from Professor Paul Gregg

<sup>232</sup> Commission Evidence from UK Creative Industries: the UK is second only to the US in terms of cultural soft power.

<sup>233</sup> Ref Professor Gregg's and LinkedIn Commission evidence; Craig Holmes and Ken Mayhew, 'Over-qualification and skills mismatch in the graduate labour market', (Chartered Institute of Personnel and Development, August 2015), <https://www.cipd.co.uk/knowledge/work/skills/graduate-labour-market-report>

<sup>235</sup> See p 56 on Enterprise above

<sup>236</sup> OECD, *Compendium of Productivity Indicators*, 2017, <http://dx.doi.org/10.1787/pdty-2017-en>

<sup>237</sup> Haldane Alan Manning, LSE economist, told the commission that investment is key – poor productivity growth is the single biggest problem for growth and the potential for promoting good work.

<sup>238</sup> 48.6% agreed and 15% strongly supported increasingly technological investment notwithstanding fears about job security.



First, we recommend stronger public investment in new technologies themselves. The sums committed by the present government in the Spring 2017 Budget to disruptive technologies, like robotics, biotech and driverless vehicle systems, are modest: only £270 million.<sup>239</sup> This lags behind competitors and falls significantly short of what is needed. We need a higher dedicated budget for new technologies within an OECD average spend of 3.5% GDP. We also need to match or exceed EU funding streams.

Second, SMEs need additional public and private investment to support innovation and scale-up of those SMEs most likely to create good jobs in Britain.

Third, we need better infrastructure to support closer collaborations between SMEs, academia, technical colleges and local government, and drive local expertise, place-based innovation and respond to local needs.

### Technology and R&D spend

We recommend that, within an increased R&D spend, a higher dedicated technology budget is needed to build on the UK's world-class research and support better use of technology by our long tail of low-productivity firms. This will support growth, spread benefits and generate good work at a time when Britain is likely to lose EU funding avenues including Horizon 2020, Eureka and Erasmus.

The Government should increase and focus R&D spend, and incentivise the commercialisation of research, in the following ways:

- **Increasing the dedicated budget** earmarked for technology R&D as a proportion of GDP, in particular for AI and related technology.
- **Encouraging collaboration** between academia, industry and government at each stage of the innovation cycle. Applicants for R&D grants should be required to demonstrate some collaboration with local government, business and communities as part of increasing levels of collaboration with relevant businesses at each stage of the innovation cycle.
- **Expanding the Higher Education Innovation Fund** and University Enterprise Zones to provide a network and infrastructure of shared facilities to apply technological innovations and support local start-ups and scale ups. The technical education trusts can advise on and co-ordinate new applications.
- **Incentivising place-based, future-orientated R&D** and University Enterprise Zones to provide a network and infrastructure of shared research and facilities to support innovation, trials, know-how, start-ups and scale ups of local SMEs.
- **Using public procurement** to support the application of place-based R&D and scale up to boost good productive work in the low-wage and public sectors, as well as the more obvious growth tech industries (see below).

<sup>239</sup> <https://www.gov.uk/government/publications/spring-budget-2017-documents/spring-budget-2017>



## Regional innovation strategies

We recommend local governments should partner with local businesses, academia and other stakeholders to develop targeted, granular place-based innovation strategies focused on the future of good work for the local population. The strategies should focus on new and growth sectors<sup>240</sup> but include planning for traditional sectors disrupted by technology.<sup>241</sup>

We recommend that regional strategies could be developed using a 'civic enterprise' policy development model to enable a more flexible, decentralised response to local challenges. This should build innovative, bottom-up, practical solutions with local people experiencing changes.<sup>242</sup> It involves diverse groups of people and stakeholders brainstorming a response to a local problem, and organising local pilots and test beds at speed. Technology can be used to support this model, for example drawing on the People's Plan for Digital.<sup>243</sup> The model would open up government policy-making and support new forms of civic engagement too.

Regional innovation strategies should extend to support shared infrastructure for regional 'clusters.' Clusters combine the best of cooperation and competition, and will lead to regional centres of excellence. Further devolutionary shifts of powers to cities and regions would help too.

## Innovation and productivity

Innovation works best on a sectoral basis: stakeholders developing and applying technological innovations to solve pressing, real-life challenges. A collaborative, sectoral approach would encourage and diffuse technological innovation to the long tail of low-productivity firms in Britain, with a view to solving our 'productivity puzzle'. We note the recent biggest downgrade to productivity forecasts since 1812 by the Office for Budget Responsibility.<sup>244</sup>

We recommend sectoral 'productivity' councils are set up to boost innovation and productivity in sectors. Building on example of the Automotive Council,<sup>245</sup> British sectoral productivity councils should be comprised of business leaders, representatives from government and trade unions, academics and working people. The councils could:

- **advise on and monitor the introduction of enabling technologies** aimed at increasing innovation and productivity in the sector
- **agree terms** and wages above the legal base line, making sure that increased productivity was reflected in the pay packet<sup>246</sup>
- **support planning** for job displacement
- **promote best standards**
- **make recommendations on skills deficits** and anticipated needs of the sector through transition. This could feed into the Future Work life-long learning accounts recommended above.

The sectoral councils should not be limited to traditional industries. New and 'pre' industries, such as big data analytics, should be encouraged to set up councils to give them an early institutional voice.

<sup>240</sup> This includes new and emerging sectors, not just traditional industries known as sectors. Emerging industries too must be supported to have a name, identity and sectoral presence.

<sup>241</sup> The submission from Deloitte noted that the sectors containing the highest proportion of jobs at high risk of automation over the next two decades in the UK were: retail and wholesale (loss of 58 percent of the workforce, 2.2 million jobs) and transport and storage (loss of 74 percent of the workforce, 1.52 million jobs). Similarly, PWC research published in summer 2017 concludes that retail and wholesale risks 2.3 million jobs, with 44 percent of all UK jobs estimated to be at high risk. PWC also suggested 2.2 million people working in transport could lose their jobs thanks to automation.

<sup>242</sup> Patsy Healey, *Civil society enterprise and local development. Planning Theory & Practice*, January 2015, vol.16, pp.11–27..

<sup>243</sup> Developed by Liam Byrne MP and Shadow DCMS team with Nesta. [http://liambyrne.co.uk/research\\_archive/launch-peoples-plan-west-midlands-uk-pilot-d-cent-digital-democracy-tech-2017/](http://liambyrne.co.uk/research_archive/launch-peoples-plan-west-midlands-uk-pilot-d-cent-digital-democracy-tech-2017/)

<sup>244</sup> Analysis by Resolution Foundation 'Freshly Squeezed' (November, 2017). On its current course, the UK economy is on course to be £42 billion smaller in 2022 compared to the March 2017 forecast.

<sup>245</sup> TUC report 'Great Jobs in Great Places,' October 2007





Regional sector sub-committees would support local application. The work of the sectoral councils should feed into national Industrial Strategy and planning for British sectors most at risk of automation, as well as growth areas.

### **Open data**

Innovation should be better supported by enabling easy access to, and use of, uncontroversial public data sets by a wider range of entrepreneurs and academics in Britain. We recommend that government should build on the UK's leading role in the field of Open Data by developing a national policy on data storage and use, clearly distinguishing between different types of data-set and use. The Technology and Ethics Commission should lead in providing advice on standards and best practice.

Since government pays for its collection and stewardship, public data is a public good. We recommend that the government review how public data could be harnessed for the common good, including the creation of good work. This might include future revenue raising from certain uses of some public data-sets alongside conditions of access.

Government should lead a public consultation about how best to achieve this goal, whilst respecting data protection. Consideration should be given to building on, and extending throughout Britain, the Mayor of London's initiatives, including the Chief Digital Officer, London Data Store, Smart London Board and Smart London Strategy.

We also recommend clearer national guidance and standards for Open Data, so that some public data-sets are readily accessible to those who wish to solve public problems innovatively. The Technology and Ethics Commission should be tasked with providing advice on standards and best practice. This will enable government and commercial entities to build applications based on data and apply them to create better services and jobs. The Open Data debate should go hand-in-hand with a debate about citizens' ownership and control of their own personal data, and privacy.

### **Support for AI clusters**

There is an international race to establish and nurture technology clusters. We recommend that the UK allows a more accommodating regulatory environment in defined zones for experimenting with AI and related technologies: for example the testing and development of driverless cars and unmanned aerial vehicles. We do not support blind deregulation (see our recommendation on a Technology and Ethics Committee below) but recognise first-mover advantage in nurturing local expertise in emerging technologies.

### **Innovation and competition law**

Competition drives innovation. The absence of competition stifles it. The creation of new businesses may then slow, labour markets may become less dynamic and the income share going to capital may rise.<sup>247</sup> In new digital and innovation markets, where data and information can be as important as price, there has been a trend towards consolidation. There are a number of reasons for this, including pre-empting threats



and the aggressive expansion of the technology giants into new markets, loopholes in control and the failure to consider the impact of mergers on innovation.

In particular, we have observed that the main parameters of competition – price, along with quantity, choice, and innovation – do not always capture the power associated with the ownership or control of mass data.<sup>248</sup> In short, it is harder to understand, judge and enforce fair competition in the technological revolution. But we think market structure is critical to driving innovation.<sup>249</sup>

Therefore, we recommend an independent review about the adequacy and application of competition law principles in new digital and innovation markets.<sup>250</sup> This should include consideration of existing measurements to evaluate market power, and enforcement.<sup>251</sup> It should be supported by higher levels of disclosure regarding use of algorithms and new data sets to enable an informed assessment.

### Giving Britain a pay rise

Fair remuneration is an integral part of what makes work good work, as we outlined in Chapter 1. Falling real wages are bad for workers and their families, and are associated with lower levels of innovation and productivity.<sup>252</sup> We agree with Director of Labour Market Enforcement that the employment conditions of the UK's labour force have become increasingly vulnerable to competitive pressures – and that the consequences in terms of pay has been worst for the weakest employees.<sup>254</sup> We note that recent revised economic forecasts suggests that real household disposable incomes are set for a long squeeze, with the poorest third of households set for an average loss of £715 a year.<sup>255</sup> The exploitation of workers in low-pay sectors such as fast-fashion, retail, care and hospitality,<sup>256</sup> is not only wrong, it is bad for the economy.

Specifically, in the context of the technological revolution, it is inhibiting the introduction of enabling technologies which are considered too expensive by businesses dependent on a low wage model; and it means that the gains of technology are not being shared.

To raise the wage floor in Britain, prepare for the technological revolution and encourage innovation, we recommend:

- **Lifting the public sector pay cap.** Since it is an arbitrary cap on pay which does not reflect the value of work done, the pay cap conflicts with our principles. It is also counterproductive because it is linked to low productivity and discourages vital work in the public sector. Increasing pay is a key way to signal the respect we ascribe to these jobs – which are set to increase in number and importance through the technological revolution. We note that public sector employees are set to be hit hardest by the fall in real earnings predicted by the Office for Budget Responsibility in November 2017.

<sup>247</sup> Tim Cowen, *System failure: Online platforms, distortion of markets, social impacts and freedom of expression*, 31 August 2017, <http://www.competitionlawinsight.com/corporate-issues/system-failure--1.htm>

<sup>248</sup> Many mergers are driven by big data: the target is the data-set. See, for example, Liza Lovdahl Gormsen, *The Impact of Consolidation and Big Data*, 31 August 2017, <http://www.competitionlawinsight.com/competition-issues/competition-law-and-democracy--1.htm>

<sup>249</sup> Philippe Aghion et al. "Competition and innovation: An inverted-U relationship." *The Quarterly Journal of Economics* 120.2 (2005): 701-728; F.M. Scherer, "Research and development resource allocation under rivalry." *The Quarterly Journal of Economics* 81.3 (1967): 359-394

<sup>250</sup> We note that Germany has introduced a new 'value'-based threshold aimed at catching the main online players' acquisition of innovative businesses.

<sup>251</sup> See for example the Commission's review of online markets in 2015. In Britain there are a number of enforcement bodies with discreet remits including the Competition and Markets Authority, the ICO and OfCom.

<sup>252</sup> REF for example IPPR publication May 2016 *Low wage sectors*

<sup>254</sup> David Metcalf, *United Kingdom Labour Market Enforcement Strategy: Introductory Report*, July 2017, <https://feweek.co.uk/wp-content/uploads/2017/07/labour-market-enforcement-strategy-introductory-report.pdf>

<sup>255</sup> *Before the end of parliament. Resolution Foundation 'Freshly Squeezed'* November 2017

<sup>256</sup> Leicester workshop. According to official figures from April 2016, there were an estimated 362,000 jobs paying less than the NMW or NLW, <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/bulletins/annualsurveyofhoursandearnings/2016provisionalresults>

## CASE STUDY: LONDON BOROUGH OF LEWISHAM

The Borough has offered discounts on Business rates of up to £5,000 for businesses based in the Borough who pay the Living Wage. As a result, the number of Living Wage employers has trebled.

- Government should aim to **increase jobs in the public sector** which pay above the floor statutory minimum level of the **National Living Wage**, and incentivise business to do the same. This is part of our ambition to build a Britain with a high-wage, high-skilled economy. The Department for Business, Energy and Industrial Strategy should work proactively with productivity councils in sectors with high levels of low pay – including retail, social care and hospitality – to develop programmes aimed at increasing and applying future skills, increasing productivity and increasing pay on a sectoral basis.
- **Stronger and more deterrent penalties** for non-compliance should be introduced for repeat or serious breaches. The support and remit of the Director for Labour Market Enforcement should be increased to enable reactive and proactive roles.<sup>257</sup>
- **Local authorities use procurement** and other measures to increase the number of employers paying the Living Wage reflecting local costs and conditions, and enables workers to live a dignified and fairly remunerated life.<sup>258</sup>
- **Joint liabilities** are introduced for the infringement of minimum wage provisions should be introduced. Lead firms should bear some responsibility for their supply chain. This will encourage joint working, prioritise and deter non-compliance. The Director for Labour Market Enforcement should be able to actively investigate supply-chain wide enforcement.

## NEW MODELS: CORPORATE GOVERNANCE AND ALTERNATIVE OWNERSHIP

Two of the major challenges, driven partly by technology, are Britain's disappointing growth in productivity and the uncoupling of productivity from wage growth. To build an economy of well-paid and secure work, boosting Britain's productivity will be essential. We think that the adoption and integration of new technology into British business effectively and efficiently lies at the heart of this challenge.

What is the most efficient and fair way of integrating new technology into a business? It is clear that the process of transforming business models to harness the power of new technology affects a wide range of stakeholders, from investors to workers, local economies to the environment. It is also clear that computer programmes which buy and sell shares on the basis of tiny fluctuations in share price mean that a model of company law which assumes that long-term investment is best promoted by advancing the interests only of those who own businesses – i.e. shareholders – is out of date.

We have heard convincing arguments on the grounds of both fairness and efficiency for broadening the stakeholders involved in the process of adopting and integrating new technologies – and in corporate governance more broadly too.

The fairness argument is straightforward.<sup>259</sup> New technology may change the nature of a job, or it may actively displace workers; it may also affect a number of the businesses' broader social responsibilities.

<sup>257</sup> Report on 'A Framework for Modern Employment' November 2017

<sup>258</sup> For example, the London Borough of Lewisham gives business rate reductions of up to £5,000 to employers which pay the London Living Wage. As result the number of Living wages employers have trebled.

<sup>259</sup> Mathew Lawrence, Corporate Governance Reform Turning business towards long-term success, (IPPR Commission on Economic Justice, July 2017), <https://www.ippr.org/publications/corporategovernancereform>; Janet Williamson, Workers on Board: The case for workers' voice in corporate governance, (TUC, 2013), <https://www.tuc.org.uk/publications/workers-boardthe-case-workers-voice-corporate-governance>

**CASE STUDY:  
MICHELLE,  
LEARNING CENTRE  
COORDINATOR,  
USDAW MEMBER  
ON USE OF ONLINE  
PLATFORMS TO  
DEVELOP AND  
DELIVER ISSUE BASED  
COURSES, SUCH AS  
SUPPORTING MENTAL  
HEALTH AT WORK.**

“The new management have been really surprised and impressed by what we do. We have regular communication between the union and management and they are now supporting me to set up a staff forum to consult with staff about what they need going forward”<sup>262</sup>

To respect the autonomy and dignity of those stakeholders, we think they ought to have a voice in the system of corporate governance. Further, recent research suggests that involving a broader range of stakeholders – particularly workers – in the process of adopting and integrating new technologies can make that process more efficient, resulting in greater productivity increases in the medium-term.<sup>260</sup> Workers in a business have a long-term interest in the success of the business. They know the details of the production process or delivery of a service; they too are likely to offer valuable insights into the opportunities and pitfalls of integrating new technology.

### Corporate governance

The existing framework for corporate governance in Britain does not support productivity growth and the creation of good work as well as it could. We think a more collaborative process governing the adoption and integration of new technology would go some way to addressing these challenges. This would help build a model of the company which is broader and more inclusive, as well as more productive.<sup>261</sup>

This Commission’s research has consistently found that, even in the most disrupted sectors, workers (and other stakeholders) are enthusiastic about the longer-term benefits of the introduction of new technology, despite their concern about the consequences of its short-to medium-term impact. Resistance by workers and stakeholders – the biggest obstacle to a successful transition more broadly – is not about the technology itself, but about a lack of meaningful participation in the process of change.

Therefore, our recommendations seek to move managers and directors away from an exclusive focus on shareholders and to increase worker participation. This will foster a greater understanding and a culture of reciprocity between all stakeholders – shareholders, managers, owners and employees – which recognises the strength and dynamism of problem-solving together through the technological revolution. We want British business to take pride in leading this shift in our business culture.

### A duty on companies to ‘involve’ stakeholders

We recommend a new duty on companies to ‘involve’ stakeholders, which must include workers. This duty should ensure that genuine stakeholders are able to realise the goal of meaningful participation in the companies’ strategic and operational decision-making, and offer options to companies to be stronger and more flexible, and for investors and workers to work towards common goals of prosperity and growth.<sup>263</sup> Our focus is the introduction of new technology but we not suggest, at this stage, that the duty should be limited or demand any particular form.

We have identified two ways in which the duty could be met: through worker representation on Boards and by establishing staff councils or ‘Co-operation Committees’ with delegated powers.<sup>264</sup> That said, companies should be flexible and willing to deploy whatever mechanism they decide best fulfils the new duty. We suggest that companies should report annually on how this has been done.

<sup>260</sup> Dorothy Leonard-Barton and William A. Kraus, *Implementing New Technology*, Harvard Business Review, November 1985 <https://hbr.org/1985/11/implementing-new-technology>; Jennifer Buchanan, Beth Kelley and Alicia Hatch, *Digital Workplace and Culture: How digital technologies are changing the workforce and how enterprises can adapt and evolve*, (Deloitte, 2016), <https://www2.deloitte.com/content/dam/Deloitte/us/Documents/human-capital/us-cons-digital-workplace-and-culture.pdf>

<sup>261</sup> ICSA: *The Governance Institute, The Stakeholder Voice in Board Decision Making*, 2017, <https://www.icsa.org.uk/knowledge/resources/stakeholdervoice>

<sup>262</sup> TUC *Unionlearn*, <https://www.unionlearn.org.uk/>

<sup>263</sup> *This recommendation responds to the evidence that suggests workers want to have more say in company decisions: the evidence we received from USDAW found that 81% of retail workers were keen to embrace technology and maximise any benefits, but just 18% feel that their employer gives them a say on how technology affects their work: Commission Evidence: USDAW response to call for evidence*

## CASE STUDY: EXPERIMENTAL SPACES AT ROBERT BOSCH GMBH AND FIDUCIA & GAD IT AG IN GERMANY

The industrial group Robert Bosch GmbH and the IT service provider Fiducia & GAD IT AG have begun to set up 'design-thinking' labs to experiment with new approaches to drive forward disruptive innovations and think about implications on staff. This promotes a long-term perspective for the labs, and gives the workforce the trust they require to accept change processes

"It's very important to us that solutions aren't developed in a vacuum; instead, employees must be at the heart of the process and involved from the outset," stresses Alfred Löckle, the chairman of the central works council at Robert Bosch GmbH.

<sup>264</sup> Companies could be given practical advice on setting up Co-operation Committees, with precedents and the publication of guidance on best practice, including induction and training

<sup>265</sup> ICSA: The Governance Institute, *The Stakeholder Voice in Board Decision Making*, 2017, <https://www.icsa.org.uk/knowledge/resources/stakeholdervoice>

<sup>266</sup> These are duties of consideration, not result, but we believe that their introduction would lead to a cultural shift and the mainstreaming of equality and diversity considerations. This builds on the successful model, introduced in the light of the MacPherson Report into the death of Stephen Lawrence, which requires public authority and those performing public functions to give 'due regard' to these needs (the public sector equality duty). The PSED has had a transformational impact on mainstreaming of equality considerations in the public sector, and we recommend this duty be extended to the private sector.

## Corporate equality duty

The public sector equality duty, which requires public bodies to consider how their decisions affect people protected under the Equalities Act, with a view to advancing equality of opportunity, should be extended in the sphere of employment to all larger employers. This would help ensure that the benefits of innovation are shared fairly and that representation on boards is diverse, and advance equality of opportunity.<sup>266</sup>

## Broaden Directors' duties

We recommend that section 172 of the Companies Act 2006 should be reformed so that directors of public limited companies have statutory duties to the long-term stewardship of the company's resources, in the interests of all stakeholders, including employees.

### Case study: Severn Trent

Severn Trent has a company employee forum which meets quarterly to discuss issues and opportunities. The forum is chaired jointly by a member of the Executive Committee and Trade Unions. Other members include representatives from HR and other business forums<sup>265</sup>

The present model, under which directors are required by law to promote the success of the company only in the interest of its members or shareholders, encourages short-term thinking over longer term investment, including investment in new technologies. It also fails to encourage constructive collaboration between investors, workers, and employers. We think this model is out of date. A broader model should encourage the more thoughtful introduction of new technology.

## Corporate transparency and reporting

We recommend stronger reporting requirements for companies. Transparency is necessary to encourage good practice and a more collaborative approach to modern business. It will support consumer choice and also inform government's response, including in areas which will need updated regulation in due course. Transparency will encourage companies to promote good practice in relation to 'good work', because it will be visible to owners, consumers, workers and regulators. Reporting obligations should include:

- **A statement of purpose** in companies' articles of association. A statement of purpose would focus companies on long term thinking and the future of work. Companies should **report** on how they have fulfilled their 'duty to involve'.
- **Details of how workers are employed and paid** including types of contract (short-term, long-term, part-time, full-time, sub-contractors), pay band, benefits, staff turn-over, and pay gaps. This should extend to pay calculations including any pay ratios.
- **Performance of the proposed 'corporate equality duty'** to encourage a focus on ensuring that the returns to new technology are fairly shared by different groups in society.



- **Ownership of the company and Board members'** details should be listed on a verifiable register.
- **Increase algorithmic accountability** by requiring recording, testing and some level of disclosure about the use of algorithms and data analysis, in particular when algorithms may affect workers or are used in a public policy context, and prohibiting algorithmic decision making which discriminates on grounds of characteristics protected under the Equality Act 2010.<sup>267</sup>

### Alternative ownership models

To ensure Britain builds a dynamic and productive economy of good work, diverse forms of ownership matter as well as corporate governance. There is evidence that diverse forms of ownership drive innovation, productivity and long-term, sustainable growth.<sup>268</sup> Such businesses tend to enhance the wellbeing of their workers<sup>269</sup> and respond better to local needs.<sup>270</sup> They give people ownership and control over their work,<sup>271</sup> which acts as a catalyst for greater commitment and engagement.<sup>272</sup> Specifically, in the context of the technological revolution, diverse ownership supports resilience and stability of both the work force and business. These are immense virtues as British businesses navigate and develop strategies to leverage the technological revolution, and the disruption that will accompany it.

We welcome the recent Alternative Ownership report.<sup>273</sup> We agree that the co-operative economy is growing but that it needs government support to take off.<sup>274</sup> Therefore, we recommend a range of policy instruments are used to encourage diverse forms of business, and profit-sharing, including:

- **Transitional government guarantees**, credits and loans to support the purchase of companies by employees, which can lead to delayed completion, and facilitate access to finance.
- **Reporting to BEIS and Treasury Committees.** Government should report annually, evaluating its policy on increasing diverse forms of ownership.
- **Support to publicise and expand** different types of employee ownership such as 'loyalty' shares which will be retained for agreed periods of time, and employee shares; and support for Employee Owned Trusts which some research indicates are more attractive to younger workers.<sup>275</sup> We should encourage piloting new forms of profit-sharing and ownership in the digital space, for example taxi platform co-operatives in competition with other app-based minicab companies such as Uber.
- **A right of 'first refusal'** for workers in a business to buy if it is being sold, dissolved or floated. Consideration should be given to extending this to a right to request to buy a business in some other circumstances: employee ownership works throughout the life-cycle of a business.
- **Advance 'Community Wealth Building'** by empowering local authorities, combined authorities and Metro Mayors to use the power of public procurement and public funds to incubate and build

<sup>268</sup> Graeme Nuttall, *Sharing success: the Nuttall review of employee ownership*, July 2012, <https://www.gov.uk/government/publications/nuttall-review-of-employee-ownership>

<sup>269</sup> Ruth Yeoman, *Governance and Voice: how mutuals and employee-owned businesses create stability, resilience and legitimacy. Making it Mutual. ResPublica Essay Collection*, 2013.

<sup>270</sup> Ref Alternative Ownership report

<sup>271</sup> Ref Co-operatives UK and YouGov polling May 2017: 67% people think the economy is 'out of control'

<sup>272</sup> Graeme Nuttall, *Sharing success: the Nuttall review of employee ownership*, July 2012, <https://www.gov.uk/government/publications/nuttall-review-of-employee-ownership>

<sup>273</sup> Report of external experts to the Shadow Chancellor <http://labour.org.uk/wp-content/uploads/2017/10/Alternative-Models-of-Ownership.pdf>

<sup>274</sup> The top 50 employee-owned companies in the UK have combined sales of over £22 billion and over 200,000 employees.



new cooperative and worker-owned businesses to deliver contracts, support local jobs and retain money within local communities; this is being done effectively by Preston Council.

- **Other support for British co-operatives** and mutuals could include improving access to long-term finance; peer-to-peer lending guarantees; enhancing and publicising tax exemptions; and increasing the voice and representation of co-operatives and mutual enterprise in regional and national government policymaking; providing an infrastructure for primary services including access to the British Investment Bank, legal advice, and tax and accounting services.
- **Regional centres** should be established to offer training, advice and support to expand co-operative models and employee ownership building on the example of the Wales Co-operative Centre.

## LABOUR RIGHTS AND STANDARDS

In Chapter 2, we outlined the considerable growth of various forms of ‘non-standard’ and divisible work in Britain, alongside the broader and pressing challenges of growing income inequality and growing inequalities of control, risk and income.

In our view we need a simple, new, future-proof legal framework; a wider application of existing employee protections; and some additional rights in response to specific challenges related to the technological revolution to update and supplement existing British labour rights.

We have considered a number of recent publications focused on the ‘gig economy’ and taken account of their findings and recommendations.<sup>276</sup> However, the challenges we have identified above go beyond the ‘gig’ economy and call for a response beyond a contractual approach to status. Our national response should extend to the fundamental components of working life for all remunerated workers: certain minimum rights to working hours, pay and conditions, and greater engagement of workers in the organisation of work and businesses.

It is important that existing fundamental rights – including labour rights – are maintained as we leave the European Union. But we must also assess the need for additional protection in the workplace in the light of the technological revolution.

Overall, we think that an intelligent and fairly regulated labour market aimed at properly supporting our dynamic and flexible national workforce will increase innovation, productivity, resilience – and wages too.

### Working towards single ‘worker’ status

All workers, whether employed or self-employed, and whether their work is typical or atypical, need a fair statutory framework within which they know where they stand on tax, rights at work and benefits which accrue from it. This legal framework should not actively encourage

<sup>275</sup> Peter Neville Lewis and Ruth Yeoman, *Busting the Millennial Myth: the Power of Purpose*, November 2016, [http://www.fielddfisher.com/media/4948679/eo-millennia\\_web.pdf](http://www.fielddfisher.com/media/4948679/eo-millennia_web.pdf)

<sup>276</sup> Matthew Taylor et al., “Good Work: The Taylor Review of Modern Working Practices,” 2017, [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/627671/good-work-taylor-review-modern-working-practices-rg.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/627671/good-work-taylor-review-modern-working-practices-rg.pdf).



atypical or any other type of working designed to reduce the statutory protection which individuals might otherwise enjoy. Workplace rights should depend on a person's true status as worker and not the precise contractual framework under which they work.

Whether a person is an employee, an agency worker or a contractor should make no difference to their entitlement to labour law protection. We therefore recommend, first, working towards a new single status statutory definition of 'worker' which encompasses all existing definitions of 'worker' and is framed without reference to the contract. That definition, which must reflect the primary components of economic dependency between the parties, must be the subject of in-depth consultation to provide certainty and to limit the scope for avoidance. It must have regard to the developing case law<sup>277</sup> and could be introduced in stages.<sup>278</sup>

Second, we recommend working towards an alignment of rights between employees and other workers. The benefits currently enjoyed by employees under a 'contract of service' should be enjoyed by all workers falling within the new definition. This should, for example, bring an end to the 900,000 current zero-hour contracts, and would mean that 'employees' and other workers would have the same level of statutory protection from day one.

A single tier system will enhance workers' and employers' understanding of their mutual obligations and decrease regulatory complexity. It should be better able to withstand the trends we have identified without constant revision. We note the direction of a series of legal cases about worker status which point in this direction, and criticism which has been levelled at the proposed new category of worker in the Taylor review, for being too complex and insufficiently protective.

Third, we need a new deal for the truly self-employed. So we recommend an incremental increase of basic contributions-based rights for the genuinely self-employed, including sick and holiday pay and shared parental leave. Any change in national insurance or tax contributions by the self-employed, aimed at bringing their tax treatment into line with the employed, should go hand in hand with new rights and safeguards.

*277 Uber v Aslam and others [EAT, 2017] and Deliveroo [CAC, 2017] This review and consultation could be led by a dedicated employment commission, as recommended in the Labour Manifesto.*

*278 For example, the recent 'Framework on Modern Employment' suggested introducing a revised test for employment status, combined with a 'worker by default' presumption.*



## CASE STUDY: GERMANY'S TRANSPORT UNION AND DEUTSCHE BAHN

In December 2016 Germany's Transport Union EVG and Deutsche Bahn reached an innovative agreement that give workers a choice of 3 options: a wage rise, a reduction in weekly time or 6 more days of annual leave.

### New rights for the technological age

We recommend developing a package of new individually enforceable labour rights to ensure all remunerated workers receive the security, dignity and autonomy that is essential to good work.

Our new rights protect these fundamental components of good work which are not adequately protected in the age of technology. They are designed to fill gaps and update labour regulation in the light of the looser employment structures and other new models of work we have seen in the UK labour market.

We intend to consult widely on these proposals. We think there will be scope for sectoral councils to agree detail, extent and implementation in different ways.

- **A freestanding labour right to not be subject to significant decisions based solely on automated processing** for workers and prospective workers; a right to fairness and non-discrimination in algorithmic decision-making and a supporting explanation concerning decisions involving automated processing. Working people, and those seeking work, should not be subject to automated decisions that affect fundamental components of good work,<sup>280</sup> and algorithms should not be written in ways which entrench or create unjustified discriminatory effects. People should be entitled to see the information they need to see if algorithms are discriminating unfairly, so that they can be challenged if necessary. They should be able to challenge these decisions too. We note that the lowest paid sectors are most likely to be affected by automated decision making.<sup>281</sup>
- **A 'no barriers' right to information and consultation.** Legal or natural persons who are 'large employers' should be required to give individuals written notice where there is a real risk of significant organisational change to working hours or the nature of work undertaken and to consult them before adopting such changes. A 'large employer' should no longer be judged solely by number of employees: thresholds should be based on either size of workforce or turnover. The right should not be conditional on a request by employees. This would support the constructive introduction of enabling technology, raise worker engagement and increase productivity.
- **A new right to flexible working for large employers** – provided a request to either reduce or increase working hours is reasonable and can be reasonably accommodated, it should be granted. This would enable workers to enjoy some of the flexibility and choice which are opened up by the digital economy and hand them back some power as to divisibility of tasks in the workplace. The right builds on an existing provision to allow a 'request' for flexible working but shifts the presumption in favour of the application to protect the principle of autonomy. Consideration should be given to extending the right to allow remote and other forms of flexible working.

<sup>280</sup> This principle should cover use of job seekers' personal data (including social media profiles) in hiring decisions. Examples include using algorithms to award a performance grade issue disciplinary action.

<sup>281</sup> Dr Laura James evidence to the APPG on Artificial Intelligence, 15 October 2017: 'Automated decisions in key areas such as justice and recruitment are already disproportionately affecting low wage earners. For example, automated job application processing is more likely to be used for high-turnover, low-skilled roles.' <https://medium.com/doteveryone/evidence-around-inequality-for-appg-ai-e019a6378853>



- **A new right to leave for learning and new skills for large employers** – to support and encourage ongoing adult learning and re-skilling. Employers should have some say in the training undertaken, but provision of training should be a shared enterprise, between FE providers and employers. Stakeholders should work towards paid time off but the right could be implemented incrementally.
- **Strengthening redundancy law** – a worker should not be treated as redundant unless the employer can demonstrate that it has consulted on and considered the possibility of retraining in relation to offers of ‘suitable alternative employment’<sup>282</sup>. We recommend introducing injunctive relief in cases where there has not been adequate consultation on these alternative ways of keeping workers in times of change.
- **An update of data protection law** for workers’ and prospective workers’ data – personal data should only be gathered, used and shared by employers following affirmative, meaningful consent. Workers should have control and portability of their own personal data too. The Data Protection Act and Employment Practices Code should be updated and extended to spell out application of the Data Protection Principles, and safeguards, to new options for data gathering and analysis in the work place.<sup>283</sup>

### Support for worker organisation

Trade unions should be supported in developing new roles and strategies to make sure that change is managed in an efficient and socially just manner. As the labour market changes, and balance of power within it shifts, we need to support new ways to build solidarity and collectivism. Otherwise, workers will be at risk of growing isolation, insecurity and exploitation.

In the past, collective bargaining by recognised trade unions operating in physical workplaces provided security and solidarity for working people. This is still the case in many sectors and must be strengthened and developed so as to be a vital part of the future; for example, by use of agreements about the introduction of technology (‘technology agreements’), and by extending existing rights to recognition, access and space. Additional support for trade unions should be provided by:

- **Exploring ways to enable digital as well as physical access** to potential members in the workplace. At the moment, trade unions’ rights to organise depend on a presence in physical workplaces, and depend on the size of those. Trade unions should be entitled to reach out to remote workers, to make it easier for unions to offer them collective representation too. Virtual as well as physical communal spaces could also be explored to enable open communication with members and potential members, and support virtual activities
- **Exploring service models for new types of membership** to open access to trade unions to freelance workers and the self-employed.
- **Using technology to establish virtual or e-unions and branches** in partnership with more traditional approaches to trade unionism.

<sup>282</sup> Existing employees could also be given priority over external candidates to bolster the obligation to re-train. Note that the right to information and consultation in redundancy law bites only when a redundancy proposal has been made

<sup>283</sup> This recommendation should be reviewed in the light of the Data Protection Bill and General Data Protection Regulations set to come into force in 2018, with notable exemptions.



- **Encouraging technology agreements** as a way of meeting new challenges cooperatively and to maximise shared benefits. These could be arranged on a firm, regional or sectoral basis.
- **Support for use of technology to increase depth of reach and engagement** with members.
- **Leading roles in advanced sector-specific data gathering** and analysis about the introduction of technology, its impact on work, and the potential to increase productivity; for example, building on USDAW's in-depth Commission survey.

In parallel, we need new ways of encouraging collective voice and cooperation among workers. We recommend supporting the innovative models which are emerging to enable workers to co-operate, to increase their security and bargaining power, and to ensure a vibrant, competitive economy. For instance, music teachers, supply teachers, childminders and actors are just some groups of workers who are finding solidarity in the formation of worker co-ops as an alternative to agencies or platforms to find work or co-ordinate activity. In many cases, these groups are being supported by trade unions, such as the Musicians' Union and NASUWT. The TUC has shown an innovative approach to managing change which combines these models and charts the path for a new approach to industrial relations in the UK.<sup>284</sup>

So we recommend that support for worker organisation should include:

- **Developing organising strategies** bringing together trade unions and new models of organisation, including the co-operative sector, with the support of national union centres like the TUC.<sup>285</sup>
- **Support for emerging models** of organisation for freelance workers and the self-employed to find work and co-ordinate activity as an alternative to relying on agencies and platforms. A small amount of financial and practical support would enable new models to grow and replicate more quickly. These include trade union and co-operative models.
- **Increasing voice** for emerging groups of workers, including establishing a new **representative body for entrepreneurs** and ensuring that self-employed workers have a voice in government and national policy making.
- **Extending the remit of the Worker Tech Catalyst<sup>287</sup>** models of collective insurance proposed in the Taylor Review to support a broader range of innovations delivered via platforms and traditional means.

<sup>284</sup> TUC, 'Shaping Our Digital Future', September 2017, <https://www.tuc.org.uk/sites/default/files/Shaping-our-digital-future.pdf>

<sup>285</sup> Co-Operatives UK, Not Alone, December 2016

<sup>287</sup> Taylor envisaged this would focus on stimulating the development of new technology based models of collective insurance. Matthew Taylor et al., "Good Work: The Taylor Review of Modern Working Practices," 2017, [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/627671/good-work-taylor-review-modern-working-practices-rg.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/627671/good-work-taylor-review-modern-working-practices-rg.pdf).



## ETHICS

### A Standing Commission on Technology and Ethics

The ethical implications of AI and new technology must be addressed as part of a national innovation strategy which addresses the broadest implications for society. Failure to do so will impede innovation and is likely to produce a range of potentially damaging unforeseen consequences. We welcome recent academic and private initiatives to establish research units or 'ethics boards'<sup>288</sup> which contribute to thinking about the ethical and social questions raised by the latest developments in technology. But this is not something that can be wholly outsourced: Government must take a lead.<sup>289</sup>

We recommend that Government set up an independent cross-disciplinary Standing Commission on Technology and Ethics to tackle the toughest ethical and societal issues through the life cycle of new technology and consider its broadest implications. This will prepare the groundwork for regulation in due course. The Chief Futures Officer and Information Commissioner should be members of this Commission, which could be hosted by the new Centre for Data Ethics.<sup>290</sup>

This Standing Commission should work with partners from academia, civil society and industry to look at some of the challenges of AI, including equality, the potential for bias and discrimination through the use of predictive analytics, security, and the interaction of artificial intelligence and human beings. We recommend new algorithmic auditing standards to ensure that decisions involving hiring, firing and performance do not result in discrimination, either implicit or explicit.

We recommend the Standing Commission develop guidance and compulsory online ethics awareness and training for companies using A.I. This could include guidance on carrying out equality impact assessments.

### Standards and kite marks

A submission from Mark Graham of the Oxford Internet Institute highlighted that when we use a product, a service or platform that was brought into being with digital labour, there is no way to know whether an exploited worker is behind it. We endorse Professor Graham's proposal to gather and share relevant information and develop kite marks or 'fairwork certification scheme' and 'fairwork platform ranking' as a way of holding platforms in the gig economy accountable.<sup>291</sup>

We recommend that government supports the development of kite marks and standards for businesses including online platforms which show 'good work' practices including adoption of the Good Work Charter. These enable informed consumers to encourage responsible corporate conduct beyond legal imperatives. Good conduct should be good for business too.

<sup>288</sup> Most recently DeepMind launched its DeepMind Ethics & Society research unit, which aims to explore the ethical challenges associated with A.I. initiative announced 4 October 2017, as promised when DeepMind was bought by Google in 2014. We note in particular the development of the Asilomar Principles which we have considered as part of our own work.

<sup>289</sup> This Commission notes that the government's AI independent report focused on growing the AI industry and not the ethical implications: <https://www.gov.uk/government/publications/growing-the-artificial-intelligence-industry-in-the-uk/executive-summary>

<sup>290</sup> For instance, in July 2017, the Information Commissioner ruled that the Royal Free NHS Foundation Trust failed to comply with the Data Protection Act when it provided patient details of 1.6 million patients to Google DeepMind to develop the diagnostic app Streams, an alert, diagnosis and detection system for acute kidney injury. Government announced a new Centre for Data Ethics and Innovation in the Autumn Budget 2017

<sup>291</sup> Note collaboration with researchers at ILO, German Ministry of Labour, IGMetall, and others at OII



# Annex





## ANNEX I

### INDEPENDENT COMMISSION ON THE FUTURE OF WORK: TERMS OF REFERENCE

#### PURPOSE

The purpose of the independent Commission is to understand emerging trends and address new policy challenges arising from the growth and fusion of technologies at work ('the new technological revolution').

The Commission will make recommendations on ways to meet the most pressing challenges which advance innovation and social justice together.

#### FOUR STAGE PROCESS

The Commission will adopt a 4 stage evidence-based approach to making policy recommendations.

First, the Commissioners will analyse existing material on the introduction and implications of new technologies on all types of work.

Second, the Commission will select sectors for more detailed review and seek evidence with a focus on the following questions:

##### New models

- What is the relationship between existing work models and challenges and the introduction of new technologies at work?
- Are trends emerging in the introduction and implications of new technologies at work? What differences in the implications for different sectors and regions can be identified?
- What opportunities are there to develop new models of: (i) working (ii) ownership and (iii) governance to maximise the benefits of new technologies for working people?
- How can these opportunities be explored? What can we learn from practice and policy in other countries and global organisations?

##### Regulation

- To what extent have traditional concepts in employment law been outgrown by new models of work?
- How can existing rights for working people be adapted and improved to operate in these new models?
- What is the impact of new technology on representation and the organisation of people at work?
- Is new legislation needed in employment or other areas of law? Is other support needed?
- What can we learn from practice and policy in other countries and global organisations?



## **Innovation**

- What is the significance of learning and innovation in the new technological revolution?
- How can learning and innovation be directed towards socially useful purposes: (i) dynamic job creation (ii) increasing pay and (iii) improving the quality of work for people?
- What roles should schools, government, business, trade unions and academic institutions play?
- What can we learn from practice and policy in other countries and global organisations?

## **Broader role of work**

- What role does work play for (i) people and (ii) society beyond the provision of income and the production of goods and services?
- What are the implications of this in addressing the policy challenges identified?
- How can we make sure that work, and our approach to work, is human-centred?

Third, scenarios will be constructed to reflect the evidence on emerging trends and key questions. The Commission will consider the strategic and policy implications of each scenario.

Fourth, the Commission will identify emerging trends and make recommendations including (i) goals and overarching principles (ii) achievable policies and priorities and (iii) areas for further research.





## **SCOPE**

In considering the key questions, the remit of the Commission will include some consideration of:

- (I) Brexit and protectionism
- (II) the productivity challenge
- (III) the demographic challenge
- (IV) the low wage economic model
- (V) regional perspectives
- (VI) equality and diversity

## **EVIDENCE**

The Commissioners will consider contributions from the public and stakeholder trade unions, academic institutions, think-tanks and other groups including:

- (I) a review of existing evidence
- (II) a digital consultation
- (III) oral evidence provided at public sessions
- (IV) written submissions following call for evidence
- (V) new research submitted by stakeholders.

## INDEPENDENT COMMISSION ON THE FUTURE OF WORK: COMMISSIONERS



### HELEN MOUNTFIELD QC (CO-CHAIR)

Helen Mountfield is a barrister and mediator at Matrix Chambers. She co-chairs the Commission on the Future of Work with Tom Watson MP. Helen is a Deputy High Court Judge and a Master of Gray's Inn. She has appeared in many significant cases, including the winning Article 50 litigation on 3 November 2016.



### TOM WATSON MP (CO-CHAIR)

Tom is Deputy Leader of the Labour Party and Shadow Secretary of State for Digital, Culture, Media and Sport. He has been MP for West Bromwich East since 2001. He is a former Defence Minister and served as Minister for Digital Engagement under Gordon Brown. Tom was chair of the All Party Parliamentary Group on Drones and sat on the Culture Media and Sport Select Committee.



### NAOMI CLIMER

Naomi Climer was the first female President of the Institute of Engineering and Technology. She is chair of the Government's DCMS Future Communications Challenge Group. Previously, Naomi was President of Sony's new global division Media Cloud Services. Naomi has worked in BBC Radio, BBC World Service and BBC News, as well as at ITV.



### JON CRUDDAS MP

Dr Jon Cruddas is a British Labour Party politician and MP for Dagenham and Rainham. He was previously the Labour Party Policy Review Coordinator. Jon has special interests in industrial economy and economic regeneration. He is Visiting Professor at the Leicester Centre for Sustainable Work and Employment Futures.

## INDEPENDENT COMMISSION ON THE FUTURE OF WORK: COMMISSIONERS



### DR NADIA DHANASH

Dr Nadia Dhanash is an investment manager and business developer who leads the Royal College of Art's enterprise and entrepreneurship centre, InnovationRCA. Prior to that she held a number of roles in the biotech sector with senior positions in business development, strategic marketing and general management at GE Healthcare Life Sciences.



### ANNE-MARIE IMAFIDON MBE

Anne-Marie Imafidon MBE is Head Stemette and co-founder of Stemettes – an award-winning social enterprise inspiring girls and young women into Science, Technology, Engineering and Mathematics roles. At age 11 she was the youngest girl ever to pass A-level computing, and at 20 one of the youngest to be awarded a Masters' degree in Mathematics & Computer Science by Oxford University.



### JOHN EVANS

John Evans is the General Secretary of the Trade Union Advisory Committee to the OCED and Chief Economist of the International Trade Union Confederation since 2012. TUAC is an independent body that represents 56 trade union centres and 65 million workers in OECD countries. John is a member of several World Economic Forum Global Agenda Councils on Employment and Inclusion.



### JOHN HANNETT

John Hannett is the General Secretary of the UK's fourth largest union, Usdaw. John sits on both the Executive Committee and the General Council of the TUC. He has served as a Low Pay Commissioner for over 10 years. John has been an ACAS Council Member and a Commissioner on both the Good Work and the Women and Work Commissions.

## INDEPENDENT COMMISSION ON THE FUTURE OF WORK: COMMISSIONERS



### JIM KNIGHT

Lord Jim Knight was a Labour MP from 2001-2010 holding several ministerial posts including Schools and then Employment Minister. Jim is Managing Director of Online Learning at TES Global and Visiting Professor at the London Knowledge Lab, UCL.



### CLAIRE McCARTHY

Claire McCarthy is General Secretary of the Co-operative Party. Claire joined the Co-operative Party from national charity 4Children where she was Director of Public Affairs. Previously Claire was a Special Adviser in the FCO, as well as Departments for Work and Pensions and Communities.



### EMMA MULQUEENY

Emma Mulqueeny is the founder and CEO of Rewired State, the UK's largest independent developer agency with a network of over 3000 data specialists. She is also the founder of Young Rewired State, the philanthropic arm of Rewired State, and a Commissioner for the Speaker's Commission on Digital Democracy.



### MICHAEL A OSBORNE

Michael A Osborne is Dyson Associate Professor in Machine Learning, Fellow of Exeter College, and Co-Director of the Oxford Martin Programme on Technology and Employment, all at the University of Oxford. Michael has a particular interest in the societal consequences of machine learning and robotics.

## INDEPENDENT COMMISSION ON THE FUTURE OF WORK: COMMISSIONERS



### **SIR CHRISTOPHER PISSARIDES (AS ECONOMIC ADVISOR)**

Sir Christopher Pissarides is the Regius Professor of Economics at the London School of Economics. He leads research on The Future of Employment in Europe programme. Christopher specialises in the economics of labour markets, macroeconomic policy, economic growth and structural change. He was awarded a 2010 Nobel Prize in Economics.



### **MICHAEL SANDEL**

Michael Sandel is a political philosopher and Professor of Government at Harvard University. He instigated the Harvard course 'Justice,' which was the first Harvard course to be made freely available online. Michael is the BBC4's Global Philosopher. His books include 'What Money Can't Buy' and 'Justice: What's the Right Thing to Do.'



### **DANIEL SUSSKIND**

Daniel Susskind is a Fellow in Economics at Balliol College, Oxford University, where he teaches and researches. He is the co-author of "The Future of the Professions". Previously he worked in the British Government – as a policy adviser in the Prime Minister's Strategy Unit, as a policy analyst in the Policy Unit in 10 Downing Street, and as a senior policy adviser in the Cabinet Office.



### **SIR TREVOR CHINN CVO**

Sir Trevor Chinn is Senior Adviser, CVC Capital Partners Ltd. He retired in April 2003 as Chairman of RAC plc after 47 years' service. From 2002 to 2005 he was also Chairman of Kwik-Fit during the period of its ownership by CVC. In 1999, Sir Trevor was appointed by Deputy Prime Minister John Prescott as Vice Chair of the Commission for Integrated Transport, stepping down in June 2004.

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