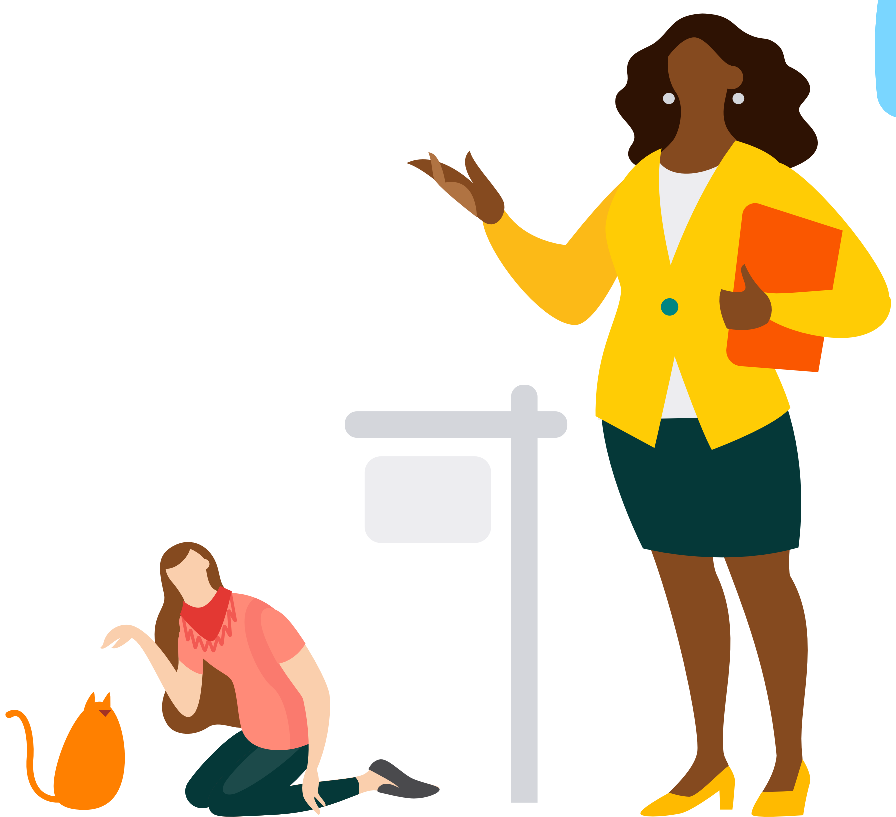
The Productivity Payout

UK Small Businesses and the Digital Economy

A report by Volterra Partners



Foreword

Chris Evans, Vice President and UK Country Manager, Intuit QuickBooks

I'm delighted to introduce *The Productivity Payout: UK Small Businesses and the Digital Economy,* a first-of-its-kind research report and economic model. At Intuit QuickBooks we believe passionately in the power of the UK's small businesses and self-employed, and are focused on helping them unlock their potential.

That's why we commissioned renowned economists Volterra Partners to help us build a greater understanding of the relationship between digital behaviours and technologies and the associated financial impact on small businesses and the broader UK economy.

Without doubt small businesses are the lifeblood of the UK's economy. They are the backbone of industry. In real terms, small businesses employ three in five people working in the private sector. That's an annual turnover of £2 trillion.

Undoubtedly, there is an entrepreneurial spirit here in the UK that is part of our national psyche. Yet, it's never been harder for small businesses to succeed and we see 50% of them fail within the first five years. That's not only shocking, but in my view unacceptable.

Too much time and effort is wasted by businesses chasing payment, categorising expenses or accessing capital, when they should be focused on what really matters to them – whether that's business growth or better work-life balance.

But it doesn't have to be this way. For this vital part of our economy, adopting a digital-led mindset has the potential to open up a world of opportunity and deliver a significant productivity boost.

As this report demonstrates, embracing just one form of digital technology can break down the fear barrier, increasing the chance of further adoption – a digital snowball. It can save a business valuable time, increase efficiency, help generate sales: all key factors that can dramatically increase productivity and propel growth.

We are amidst a technological revolution. 85% of people in the UK have a smartphone and 30% of small businesses use one as their primary device to run their business. Yet when compared to other countries, despite the UK being the sixth largest economy, we rank 18th when it comes to our propensity to adopt digital innovation.

We have to smash through this barrier to realise the productivity payout that the digital economy can deliver for small businesses.

For the very first time, Volterra has comprehensively modelled the role Making Tax Digital (MTD) will play in prompting small businesses to adopt a digital-led strategy and realise the associated productivity benefits.

The findings are astonishing. By adopting digital behaviours, small businesses can thrive and set their sights on success. The report demonstrates that MTD and three simple additional catalysts could unlock a productivity payout of £57 billion for UK businesses over five years.

In addition to MTD, catalysts such as Open Banking will put automation at the heart of small businesses, further streamlining operations and driving efficiencies.

I speak to hundreds of small businesses every year. I know their fears. I know their struggles. But most of all I know their successes. I know that when digital and automation meet, we can supercharge productivity and usher small businesses into a new era of prosperity with the greatest chance of success.

Together we can seize this opportunity.

I hope you enjoy the report.

Chris Evans

Introduction

Paul Ormerod, Partner, Volterra Partners

The main focus of this report is on the specific issue of the opportunities which the digital economy provides to SMEs.

The productivity benefits of digital adoption are substantial. But there is clear evidence of underuse of ICT in UK SMEs which means these gains are not being realised.

But it is worth taking a step back and setting it in a much broader context.

The Industrial Revolution, which began in Britain in the late 18th century, was possibly the single most important event in human history.

From the start of civilisation, the bulk of humanity had experienced a daily round of unremitting toil and drudgery, existing for the most part on the edge of starvation.

Innovations had taken place over the centuries, but the pace of advance was exceptionally slow. The level of productivity and living standards were not noticeably better in 1700 than they had been in the Roman Empire.

The Industrial Revolution changed all that. For the first time ever, technological innovations improved individual lives in ways which were readily apparent during the course of a single generation.

Now, the Western economies have a material living standard which exceeds even the wildest dreams of people 200 years ago.

And it is not just material wealth which has surged. Health, life expectancy, education – all these things have moved forward enormously. Pleasingly, countries such as South Korea, countries which were very poor in the mid-20th century and which have adopted the principles of market-oriented economics have since flourished in the same way.

It is innovation which has made all this possible. Working out ways to develop not just new products and services, but providing existing ones more efficiently, is the key.

The digital revolution of the 21st century promises not only to continue this trend, but to accelerate the pace of innovation, and so deliver yet more benefits to individuals and to society.

We have of course seen dramatic scientific discoveries over the course of the past 200 years.

Most innovations are much more modest. Crucially, however, they are far more frequent.

Very few people can work out the theory of general relativity or discover DNA. But many people have the ability to innovate, to do things better now than they did previously.

It is the pervasive nature of innovation, affecting every sector of the economy and society, which accounts for its massive impact.

The report illustrates the potential of just one practical example of innovation; financial management software. The gains, as documented in the report, can be substantial. It is exactly through seemingly simple examples of innovation such as this that prosperity grows.

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Executive Summary

UK Small Businesses are critical to the UK economy and its future competitiveness

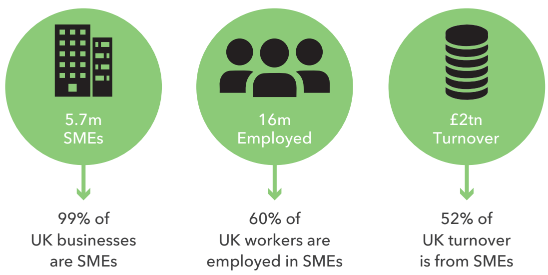
A digital revolution – and a productivity payout – is waiting around the corner for UK SMEs.

The cornerstone of the economy – the UK's 5.7 million SMEs make up 99% of all businesses. Their 16 million workers make up 60% of all employment, and their £2 trillion turnover makes up 52% of all economic output.

But it becomes immediately clear that there is potential for SMEs to become more productive on a turnover-per-worker basis, relative to the UK as a whole. Whilst it is a global trend that smaller companies are less productive, it is also true that UK SMEs are particularly unproductive when compared with other OECD countries[1].

For developed countries, the measure of productivity is critical given there are very few new inputs that can be made to drive economic growth. For any given economy to grow, it needs to keep generating more wealth per head of population. As such, productivity improvements are required to generate more outputs from the same inputs.

The digital divide sits at the heart of the UK's stagnant productivity problem. As it stands, a full quarter of businesses with fewer than ten employees – 1.4 million businesses – only use one form of digital technology. Using email but not word processing, or viewing their bank account online but not using it to pay bills[2]. UK SMEs rank only average in an EU study of adoption of new digital technologies[3]. There is significant room to improve.



The UK government recognises this problem. The Industrial Strategy released in 2017 established an innovation fund to work towards the goal of making the UK the most innovative economy by 2030. Adoption of digital is a crucial component of innovation.

The digital revolution must be realised

There are many productivity benefits of digital adoption – such as reduced time spent on tasks, and reduced errors – that positively impact both firms and whole economies.

Most importantly, one small nudge towards adoption of a digital technology could result in 'spill-over', wherein businesses are encouraged to widely adopt many of the available digital behaviours and technologies. These further digital behaviours would drive further productivity benefits, but also interoperate with the original technology, producing greater cumulative effects. Furthermore, the time saved is likely to be spent on more productive tasks such as driving sales and lead generation.

The April 2019 rollout of the Making Tax Digital (MTD) initiative will cause over a million SMEs to experience spill-over benefits of a new digital technology: financial management software.

From enabling better cash flow and human resources management, to freeing time for more productive activities such as sales, marketing or training, the potential benefits are huge.

This report investigates the digital revolution that MTD has the power to catalyse for UK SMEs. It finds that there is an annual productivity payout of £6.9 billion available – or £46 billion over five years - if all SMEs take up the opportunity presented by MTD to adopt the host of new digital processes and behaviours offered by financial management software.

It presents the first five-year roadmap to realising not just that £46bn productivity payout, but also a further £11bn boost, taking the total economic gain to £57bn over the next five years.

The roadmap to the productivity payout

The first – and only confirmed – phase of MTD will come into force in April 2019, and will require firms to submit their VAT returns via a digital link in MTD-compliant accounting software. It will only be compulsory for the 1.2 million[4] businesses that are VAT registered and are over the £85,000 threshold.

As a result of immediate spill-over benefits, this first phase of MTD has the power to catalyse an initial annual productivity payout of £6.9bn.

Digital adoption boosts productivity

Industry schemes – such as the integration of Open Banking into accounting software – have the potential to act as an additional catalyst. Other initiatives could include the provision of better education for firms on the benefits of digital adoption so that they are incentivised to take action themselves, or HMRC implementing plans to extend MTD to more, or all, firms.

This report demonstrates the potential payout of government, industry and SMEs working together on such schemes to accelerate implementation. In the best case scenario, £11bn of extra productivity payout is available over the next five years over and above that generated from the first wave of MTD rollout in April 2019.

Of course, once firms have adopted accounting software, there are likely to be further spill-over benefits. This report does not attempt to quantify these, as they will be slower to realise, across a smaller proportion of SMEs; but it is worth noting that the initial intervention in the form of MTD and other industry action can catalyse a positive chain reaction in firms' adoption of digital, and resulting productivity.

The digital dividend paid across sectors and regions

All regions and sectors claim a portion of an £11.9 billion annual benefit if all businesses were catalysed by MTD. There is an average increase in business turnover of £4,400. The sectors that would see the greatest proportion are Wholesale and Retail (£2.8bn; £7.6k per business), Construction (£1.4bn; £4.2k per business), Manufacturing (£1.1bn; £8.1k per business) and Professional Services (£1.1bn; £2.3k per business). These sectors benefit the most given their large contribution to SME turnover and their high turnover per business.

London firms would benefit the most on a per-business and total basis, with a £5,700 potential gain for an average business and £2.8bn in total up for grabs. Although the model accounts for existing digital uptake limiting the number of businesses that could benefit in London, that dampening effect is outweighed by the additional benefit of digital interoperability and workers' more advanced digital skills.

North East firms benefit almost as much with a £5,300 potential gain for an average business, driven by the larger-than-average size of registered businesses in the region implying greater base levels of digital skill amongst workers.

Economic modelling and this report

The model uses the British Population Estimates dataset from the ONS, which contains the number of VAT and/or PAYE registered firms plus the number of unregistered firms, the methodology of which can be found in Appendix B. This dataset is regarded as the official estimate of the UK business count. Turnover per business and per worker has been used as a proxy measure for productivity. To inform the assumptions used in the model in the report, a thorough literature review was conducted on the drivers and impacts of digital adoption, which can be found in Appendix C.

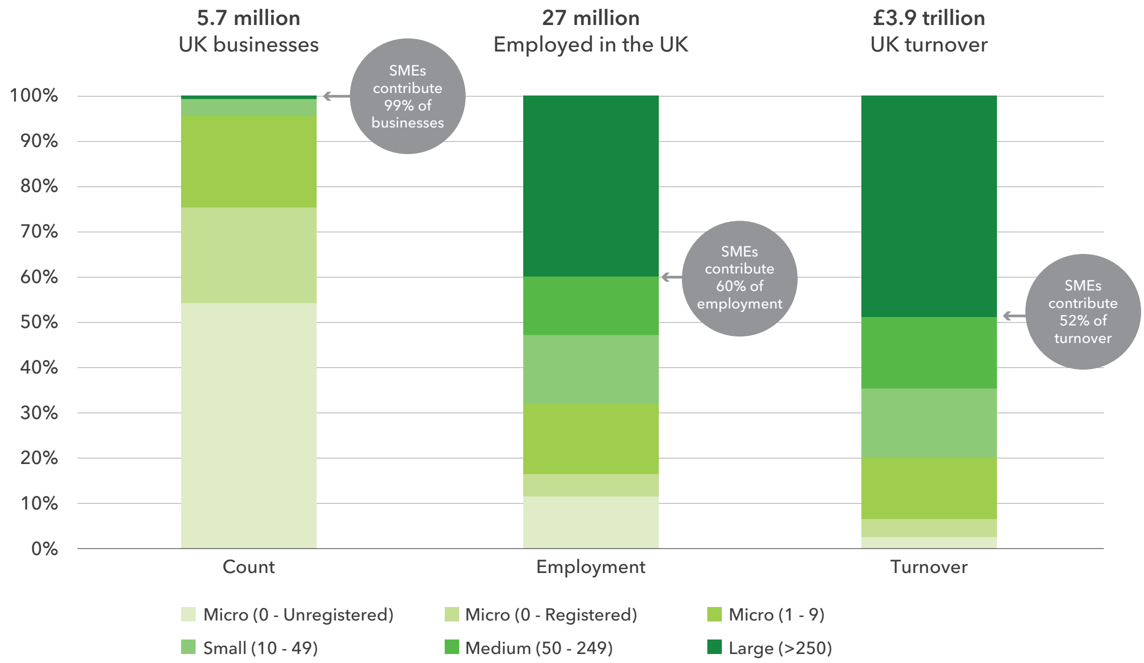
02

The makeup of SMEs in the UK

2.1

The UK has 5.7 million businesses which employed 27 million workers and turned over £3.9 trillion in 2018. Whilst Small and Medium-sized Enterprises (SMEs) account for over 99% of all these businesses, they account for only 60% of employment and 52% of turnover, with the rest being generated by large firms.

Figure 1: UK businesses by number of employees: count, employment & turnover



Source: Business Population Estimates, 2018

2.2
Micro businesses are those which employ fewer than ten people and they make up 5.4 million of the 5.7 million SMEs. There is a 'long tail' of turnover amongst these micro businesses in the UK, meaning that although there are 5.4 million of them, they contribute a disproportionately small amount of SME turnover (£0.8 trillion, 40% of total SME turnover), compared to the 35,000 medium sized firms which account for less than 1% of SMEs but contribute 30% of turnover. The main driver of this long tail is the significant number of micro businesses which have zero employees (so are either Sole Proprietors or Partnerships); they account for 75% of all SMEs but only 14% of UK SME turnover. Those zero employee firms which are not registered for either VAT or PAYE have an even longer tail, accounting for 55% of all SMEs but only 3% of UK SME turnover.

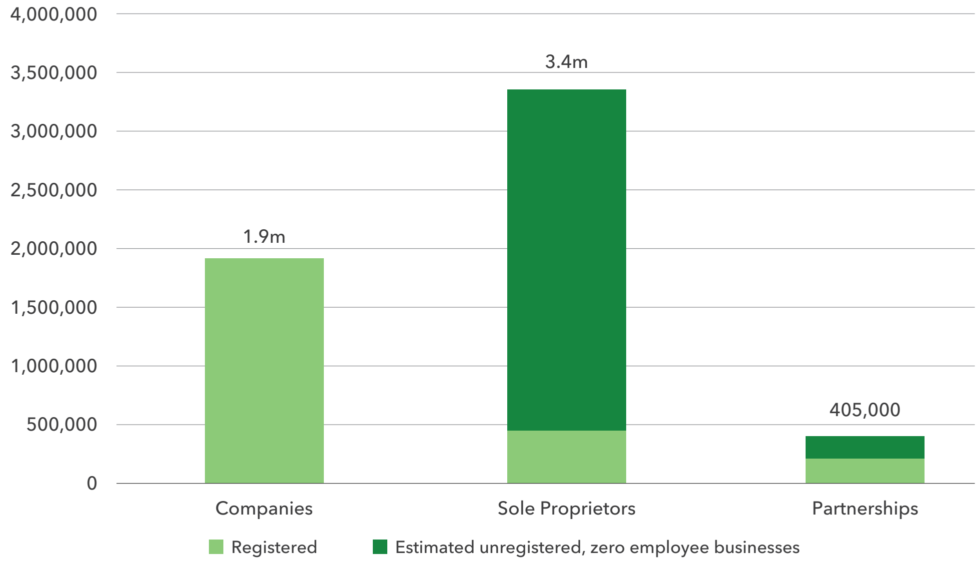
VAT and PAYE registration

2.3
In the UK, a business is only required to register for VAT when its VAT taxable turnover exceeds £85,000 in a twelve-month period. With a few minor exceptions businesses who begin to employ workers register with HMRC to operate payroll and where appropriate deduct income tax and national insurance according to PAYE rules and pay the sums deducted to HMRC. Businesses can and do register for VAT if their annual VAT taxable turnover is below the £85,000 compulsory registration threshold, for example, where they solely or mainly trade with other VAT registered businesses. In such instances the ability to recover the input VAT that they have incurred will boost their profit margin.

2.4
Business Population Estimates report that in 2018 there were 2.6 million businesses registered in the UK for either VAT, PAYE or both. The total count of UK businesses needs to include both the number of registered businesses and an estimate of the number of unregistered businesses. In 2018, the ONS estimated that there were 3 million unregistered businesses bringing the total number of business in the UK to 5.7 million, which is the estimate that has been used throughout this report. A summary of the estimation methodology from the ONS can be found in Appendix B.

2.5
Figure 2 shows that, when considering only registered businesses, Companies account for 74% (1.9m) of all businesses. However, after some 3 million unregistered Sole Proprietors and Partnerships are estimated, the distribution of businesses amongst legal status changes significantly; now Companies only make up 34%, and Sole Proprietors make up 60%. Notably, it is this large estimate of unregistered zero employee businesses which significantly contributes to the 'long tail' of turnover in SMEs, since the turnover of these unregistered businesses will (by definition of the regulations around when a company needs to register) tend to be under the VAT registration threshold of £85,000.

Figure 2: UK SMEs by legal status



Source: Business Population Estimates, 2018

Count and size distribution of SMEs

2.6
There are 5.7 million private sector businesses in the UK; 5.7 million (over 99%) of these are SMEs, and just 7,500 are large businesses. SMEs vary in size, but employ fewer than 250 workers. Large businesses employ 250 workers or more.

2.7
The vast majority (96%) of SMEs are micro businesses, defined as employing fewer than ten people. As the charts show, of the 5.7 million firms, 4.3 million (75%) have no employees at all, known as Sole Traders or zero employee businesses (Figure 3). The remaining 1.4m SMEs which do employ workers are divided into 1.1 million micro businesses which employ up to 9 workers each, 210,000 firms which employ between 10 and 49 workers, and just 35,000 which employ between 50 and 249 people (Figure 4). Over half (3.1m) of all SMEs are unregistered, zero employee businesses.

Figure 3: Employing & zero employee SMEs;

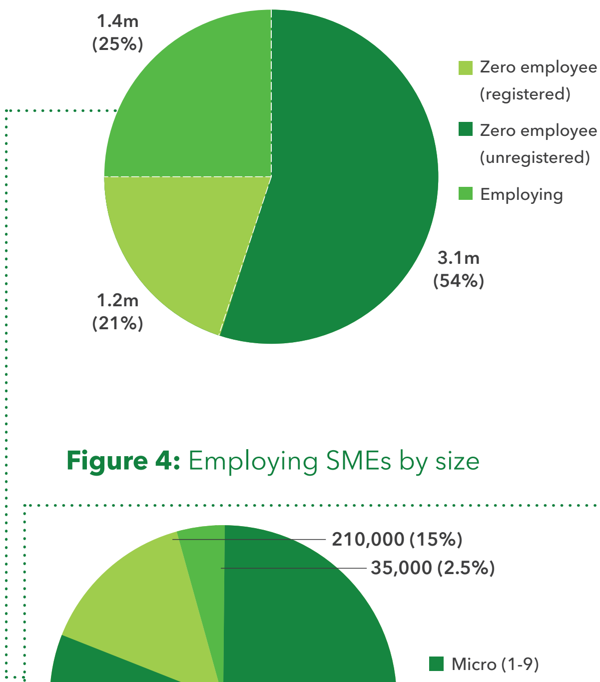
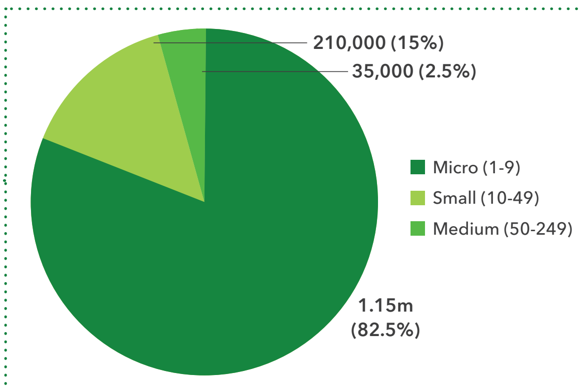


Figure 4: Employing SMEs by size



Source: Business Population Estimates, 2018

Employment and employees

2.8

There are 27 million people employed in the UK private sector; 16 million (60%) are employed in SMEs, and 13 million are employed by large businesses. Therefore, whilst large businesses only account for <1% of all businesses, they employ 40% of workers.

2.9

Due to the large number of zero-employing SMEs, statistics on SMEs can sometimes be at best confusing or at worst misleading. For example, whilst the average number of people employed by an SME is 2.9, the average number employed by an 'employing SME' is actually 8.4.

2.10

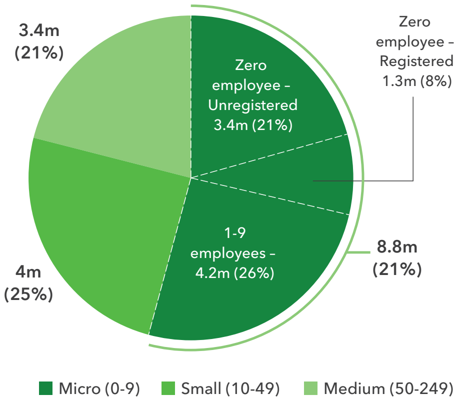
Figure 5 shows that just over half (54%) of those employed by SMEs are employed by micro businesses, however contained within this are almost 30% who work in a business which doesn't employ anyone (that is, a zero employee business).

2.11

Of the 5.7 million UK SMEs, only 1.4 million are employing businesses. These businesses have a total employment of 11.6 million, which is fairly equally distributed across micro, small and medium sized businesses (Table 1). Considering non-employing firms (or zero employee businesses), employment is 4.6 million which equates to an average employment of 1.09 per business. This may seem counter intuitive; however, the higher-than-one average reflects the number of estimated unregistered partnerships in which more than one person is employed yet still has zero employees.

16 million people employed by SMEs

Figure 5: Employment in UK SMEs



Source: Business Population Estimates, 2018

Table 1: Employing UK SMEs

	Number of businesses	Employment	Average employment per business
Micro (0 employees)	4,278,000	4,643,000	1.09
Micro (1-9)	1,137,000	4,159,000	3.66
Small (10-49)	210,000	4,083,000	19.44
Medium (50-249)	35,000	3,399,000	97.11
TOTAL (employing businesses only)	1,382,000	11,641,000	8.42
TOTAL	**5,700,000**	**16,000,000**	**2.88**

Source: Business Population Estimates, 2018

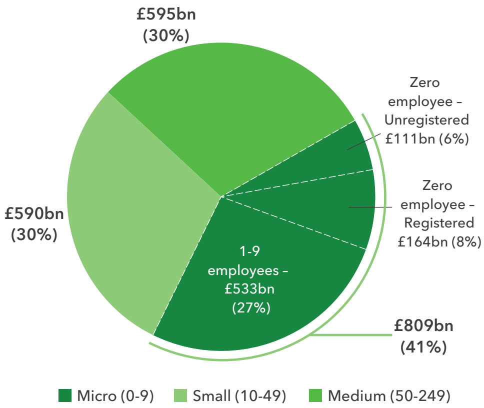
Turnover

2.12
In 2018, UK businesses turned over £3.9 trillion; £2 trillion (52%) was turned over by SMEs.

2.13
Of all SME turnover, micro businesses contributed £809 billion and, within this, zero employee businesses contributed £275 billion. Small and medium businesses each contributed c.30% (£600bn each). Overall, employing SMEs turned over £1.7 trillion or 86% of total SME turnover.

£2 trillion SME turnover

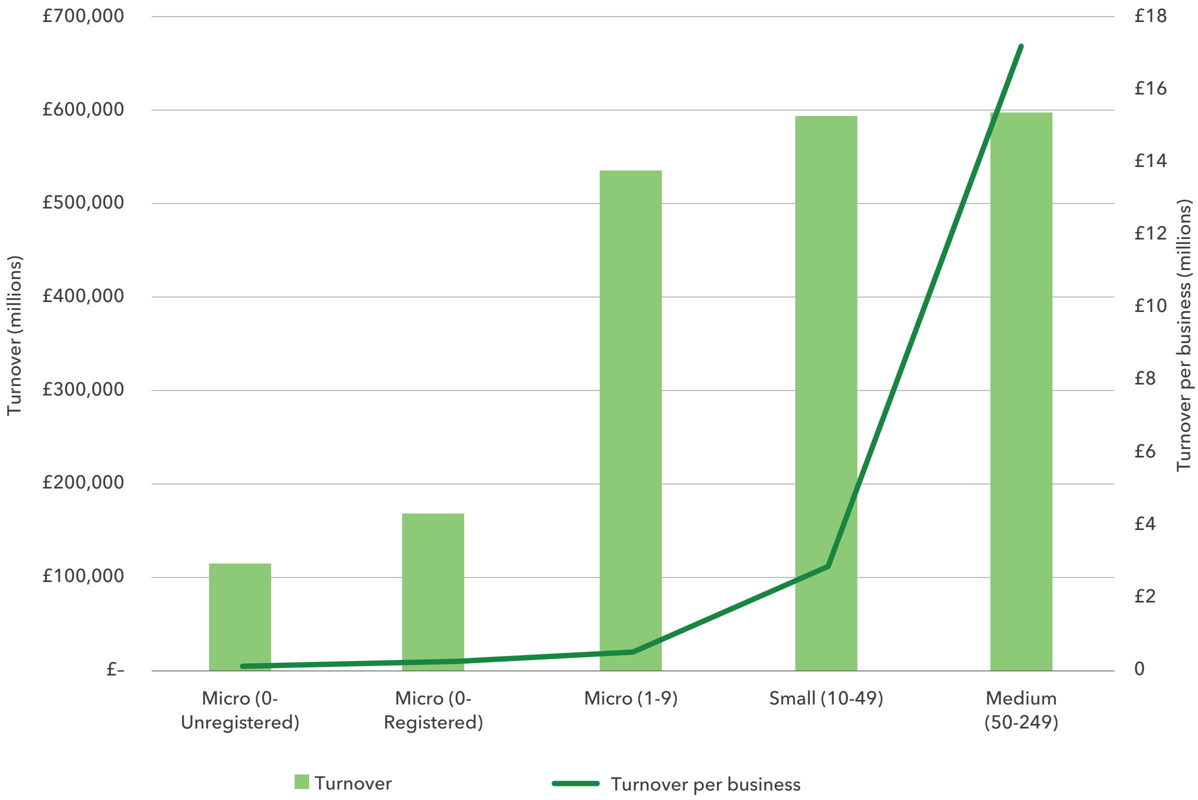
Figure 6: UK SME turnover (£)



Source: Business Population Estimates, 2018

2.14
A long tail of turnover is evident once the number of businesses in each size band is taken into account (Figure 7). The average turnover per business for all micro businesses (0- 9 employees) is £150,000 but this hides the large difference between the firms with no employees and those employing people; average turnover per business is significantly lower for unregistered zero employee firms (£36,000) than for registered zero employee firms (£139,000) and micro businesses with between 1 and 9 employees (£469,000), both of which are considerably smaller than the turnover of average small (£2.8 million) or medium-sized (£17.1 million) firms. For large firms, it is substantially higher at £249 million. Notably there will be much variation across businesses around these average business turnover figures.

Figure 7: Total and average business turnover by size

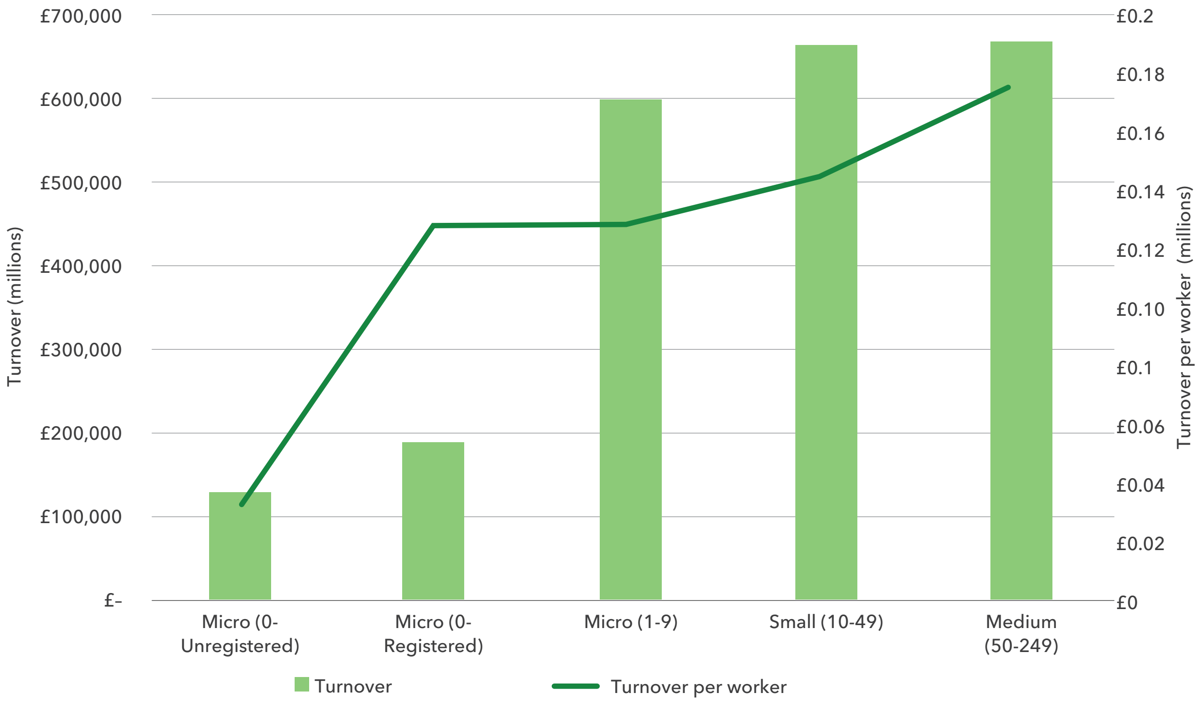


Source: Business Population Estimates, 2018

2.15

Some of this variation can be explained by considering turnover per worker (Figure 8) rather than turnover per business (Figure 7). The average turnover per worker for all micro businesses is £92,000, but for unregistered zero employee firms it is only £33,000 (this is slightly lower than the per business number due to average employment in these firms being 1.09 rather than one as shown in Table 1). Interestingly, the turnover per worker for registered zero employee firms and firms with between 1 and 9 employees is almost identical at £128,000 implying that turnover per business differences between these two size bands is mainly scale-based. The average turnover per worker increases to £145,000 for small firms and £175,000 for medium firms. The trend does not increase when we move up to considering large firms, which have an average turnover per worker of £174,000, almost identical to that of medium-sized firms. The registration status and the number of workers therefore does explain much of the variation in turnover, but there is also an evident rise in productivity per worker as worker numbers increase up to medium-sized firms.

Figure 8: Total and average worker turnover by size



Source: Business Population Estimates, 2018

SMEs by Region

2.16

In each region, SMEs account for over 98% of all businesses. There is much regional variation when considering the three main outcome measures: number of firms; number of employees; and turnover. Table 2 shows that London has by far the most SMEs (19% of all UK SMEs) and contributes the largest amount of turnover (30% of all UK SMEs' turnover). The disproportionately high contribution of turnover implies that London firms are particularly productive. There are many reasons behind this productivity gap. There are well documented agglomeration effects from clustering that happens in dense areas such as a capital city; if different types of people are closer together, there are huge benefits to be had from knowledge sharing, more rapid innovation and higher productivity. The status of the capital as a centre for opportunity means that it attracts highly skilled workers and these in turn make the city more productive, exaggerating the productivity gap with other regions.

2.17

The South West has a fairly large number of SMEs (546,000), however they contribute a disproportionately small amount of UK SME turnover (6.5%) when compared to other regions with a similar number of SMEs (East of England contributes 9% and the North West contributes 8.6% and both regions have similar numbers of SMEs). This implies that the SMEs in the South West are, on average, less productive than those in other parts of the country.

2.18

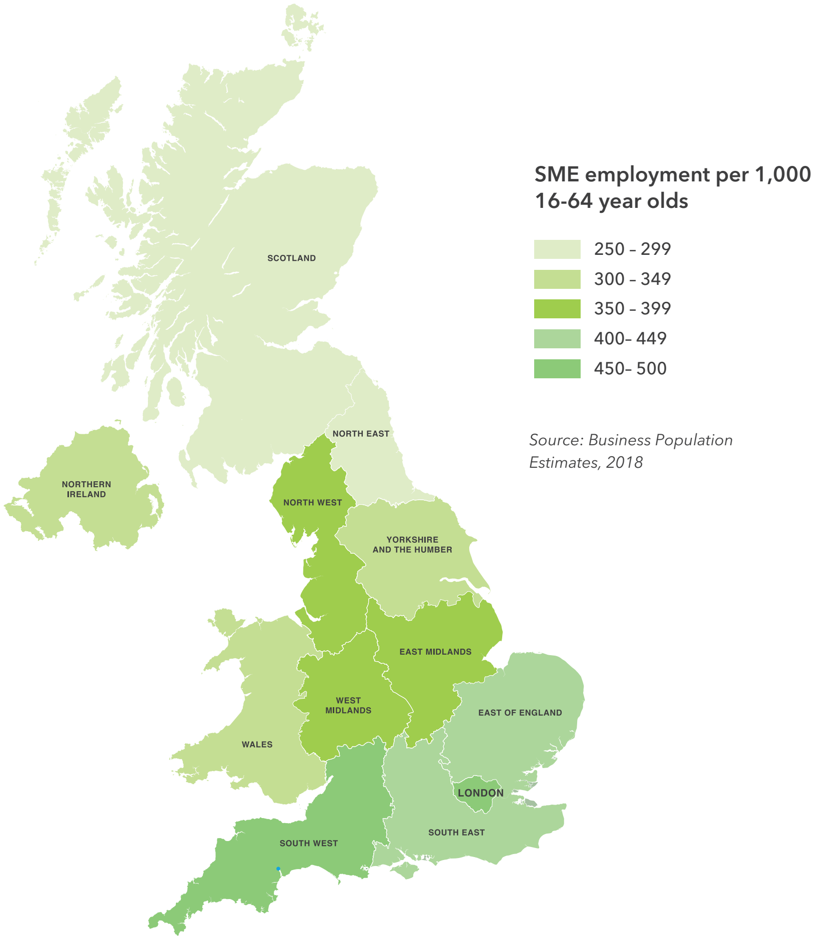
London and the South East have the highest SME employment (18% and 15% of all SME employment respectively) and Northern Ireland has the lowest at 400,000. When looking at SME employment as a proportion of the working age population (Figure 9), London has the highest SME employment density and the South West, South East and East of England also have fairly high densities.

Table 2: Regional count, employment and turnover of UK SMEs

Region	Number of SMEs	% of SMEs	Employment (000)	% SME Employment	Turnover (£m)	% SME turnover	Turnover (£K) per business	Turnover (£K) per 1000 workers
East Midlands	370,000	6.5%	1,100	6.9%	113,000	5.7%	307	101
East of England	560,000	10.0%	1,600	9.7%	179,000	9.0%	316	113
London	1,090,000	19.3%	2,900	17.6%	590,000	29.6%	539	205
North East	160,000	2.9%	500	3.0%	45,000	2.3%	277	92
North West	540,000	9.6%	1,700	10.2%	171,000	8.6%	314	103
Northern Ireland	130,000	2.3%	400	2.6%	46,000	2.3%	345	106
Scotland	330,000	5.8%	1,100	6.7%	106,000	5.3%	322	97
South East	870,000	15.4%	2,400	14.7%	297,000	14.9%	341	124
South West	550,000	9.6%	1,500	9.1%	129,000	6.5%	236	87
Wales	200,000	3.5%	600	3.8%	54,000	2.7%	270	86
West Midlands	450,000	7.9%	1,300	8.2%	144,000	7.2%	322	108
Yorkshire and the Humber	400,000	7.1%	1,200	7.5%	120,000	6.0%	300	98
TOTAL	**5,700,000**		**16,000**		**2,000,000**			

Source: Business Population Estimates, 2018

Figure 9: Regional SME employment per 1,000 working age population



Source: Business Population Estimates, 2018

2.19

The above regional variations on the three main outcome measures – number of firms, number of employees, and turnover – barely interact at all with SME size, which can be seen in Figures 16, 17 and 18 in Appendix A.

2.20

Across all regions, there is a clear strong trend that turnover per business is lowest for unregistered businesses, and then increases for registered businesses and as business size increases. However, there is a clear productivity gap between London firms and other regions. Compared to the next most productive region, the South East, London's productivity gap is 17% for unregistered firms, 22% for registered zero employee firms, 100% for micro (1-9) businesses, 71% for small firms and 60% for medium firms. Other measures of productivity such as turnover per worker and Gross Value Added per worker consistently show that London's productivity is far superior to other regions[5]. Table 10 in Appendix A displays turnover per business as a percentage deviation from the national average for each business size, and highlights some mild interactions.

SMEs by Sector

2.21

Table 3 shows the sectoral breakdown of UK SMEs over the three main outcome measures – number of firms, number of employees, and turnover. The table highlights that the Construction, Professional, Scientific and Technical Activities, and Wholesale and Retail trade sectors are most important to the UK economy. These sectors are the three largest contributors to the UK on all measures.

Table 3: UK SME count, employment and turnover by sector, 2018

Sector	SME count	% SMEs	Employment (000)	% SME Employment	Turnover (£m)	% SME Turnover	Turnover (£K) per business	Turnover (£K) per 1000 workers
Agriculture, Forestry and Fishing	160,000	2.8%	400	2.7%	38,000	1.9%	242	87
B, D & E[6]	30,000	0.6%	100	0.8%	39,000	2.0%	1,143	296
Manufacturing	290,000	5.1%	1,500	9.5%	187,000	9.4%	648	122
Construction	990,000	17.5%	1,800	11.3%	239,000	12.0%	241	130
Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	550,000	9.8%	2,300	14.4%	658,000	33.1%	1,187	281
Transportation and Storage	330,000	5.7%	700	4.5%	90,000	4.5%	277	124
Accommodation and Food Service Activities	190,000	3.3%	1,400	8.5%	56,000	2.8%	301	40
Information and Communication	360,000	6.4%	900 5.3%	118,000	5.9%	0.32	325	135
Financial and Insurance Activities	90,000	1.5%	300	1.9%	*	*	0	-
Real Estate Activities	120,000	2.0%	400	2.3%	49,000	2.5%	422	129
Professional, Scientific and Technical Activities	820,000	14.4%	2,000	12.1%	217,000	10.9%	266	110
Administrative and Support Service Activities	490,000	8.7%	1,500	9.0%	165,000	8.3%	337	113
Education	280,000	5.0%	500	2.9%	19,000	1.0%	67	40
Human Health and Social Work Activities	360,000	6.4%	1,300	7.7%	57,000	2.9%	159	46
Arts, Entertainment and Recreation	280,000	4.9%	500	3.2%	30,000	1.5%	110	58
Other Service Activities	330,000	5.9%	600	4.0%	29,000	1.4%	86	44
TOTAL	**5,700,000**		**16,000**		**2,000,000**			

*Source: Business Population Estimates, 2018. * Data for turnover in Financial and Insurance Activities sector was not available on a comparable basis*

2.22
Figures 19, 20 and 21 in Appendix A show that there is some interaction with size and region across each of the three main outcomes.

2.23
There is reasonable sectoral variation in productivity per business, particularly with the small and medium sized firms, and the sectors vary to a greater extent than the regions do in terms of turnover per business. Table 12 in Appendix A outlines turnover per business as a percentage variation from the average for each sector and business size. The interactions are slightly more prominent than the regional equivalent in Table 10.

2.24
Wholesale and Retail (G) and non-manufacturing production (BDE) have far higher turnover per business than other sectors, and it may be true that these sectors are much more productive than others in some respects. ONS research[7] research based on data from 2016 states that UK businesses which declare international trade in goods are around 70% more productive on average than non-traders, and that most direct trade is undertaken by Manufacturing and Wholesale and Retail industries. This effect might help to partially explain why the turnover per business of medium-sized firms in these industries is relatively speaking so much larger than that of the smaller firms, since firms which trade internationally tend to be larger in size[8].

2.25
Labour productivity estimates from the ONS state that output per worker[9] (another measure for productivity) for BDE is also very high relative to other industries. Furthermore, turnover per worker for both BDE and G sectors are higher than other sectors, although the gap relative to other sectors is less pronounced than when looking at turnover per business[10]. For these sectors, the turnover produced per worker is reliant on large levels of inputs per worker (and is, in some respects, less reliant on what those workers actually do). In other words, wholesalers, retailers and manufacturers buy in products and components which they then go on to trade, so the costs of those inputs represent proportionally more of total turnover than for other sectors which trade in services, where the primary driving force of productivity is the skillsets of the workforce in delivering the services that they produce and then subsequently trade. As the UK's economy has shifted from a manufacturing to a service based economy, placing a value on the output produced has become harder.

2.26
Linked to this, it is also important to bear in mind that turnover per business is only a proxy measure of productivity, and that in the case of these two sectors, their apparent superiority is at least partly a function of the way in which 'productivity' has been estimated. Many of the BDE industries like mining, quarrying, electricity, gas, water supply, sewerage, waste-management etc. act like natural oligopolies, with high barriers to entry (such as expensive infrastructure) and high demand for the goods or services. Overall, this means there only a few SMEs in these sectors (30,000 or 0.6%) but their turnover is disproportionately high (£39bn or 2%). Despite this turnover not being a very large part of all SME turnover, their average turnover per business is very high. Similarly, Wholesale and Retail achieves a high average turnover per business through contributing a high proportion of total SME businesses (550,000 or 10%) but a disproportionately much higher turnover (£658bn or 33%).

2.27
However, whilst turnover per business is high, the ONS[11] reports that output per worker in Wholesale and Retail is fairly low, the CBI[12] estimate that competitive pressures are impacting the retail sector's productivity, and IPPR[13] state that low wage sectors such as retail are less productive than higher wage sectors. These contrasting accounts of 'productivity' highlight the difficulties associated with measuring it.

03

Digital technology, productivity and economic growth

The full literature review of sections 3 and 4 can be found in Appendix C.

3.1

As our economy has shifted from manufacturing (where you make products which have an explicit value) to services, it has become harder to put a concrete value on different elements. This is particularly true in services like ICT where the quality and scope of what it covers or what it can do continues to grow and yet at the same time the price falls. This leads to the question of ICT's intrinsic value and how it can be measured.

3.2

A General Purpose Technology (GPT) is a technology which affects all regions and industries, and thus has a fundamental impact on growth. Part of the reason for a GPT having such wide-reaching effects is its facilitation of spill-over benefits (external benefits of an investment felt by parties beyond those parties for which the investment was originally intended). ICT is widely considered to be a GPT.

3.3

There is much literature around the positive impact that digital adoption and ICT use (as opposed to ICT production) has on productivity, both on a firm and whole economy level. UK firms have found that the use of online analytical services increases productivity by an average of 8% compared with firms that do not use such services[14] and a study by Oxford Economics[15] identified potential additional output of £92bn if lower performing firms could increase their digital technology use up to the standard of leading firms. However, there are lots of areas of digital where the benefits are currently not as well understood such as AI & data analytics.

3.4

Noticeably whilst there are some fears over digital replacing jobs, most early adopters and those surveyed conclude that it is not about ICT replacing people but about the use of ICT enabling people to be more efficient & productive.

Economic Growth

3.5

Economic growth impacts the living standards of those living and working in the economy. There are challenges in measuring elements of growth, presenting significant barriers to determining causes of growth. Productivity is one essential driver, but like other growth elements is very difficult to measure.

3.6

Economic growth can improve the living standards of wage earners, pensioners and public services. The rate of growth can be affected by a number of variables, both short and long term. A key determinant of growth is productivity, which itself is partly determined by innovation.

3.7

There are many developments which might constitute innovation; for example, learning how to produce more of the same kind of output from a given set of inputs, creating the possibility of developing new kinds of output or enabling new processes to improve the quality of what can be produced. An economy needs to be able to create products based on innovations if the benefits of innovation are to be realised. In economies where resources are already fully exploited, the only potential source of growth is increased productivity.

3.8

There are two generally used measures of productivity: labour productivity and total factor or multifactor productivity (TFP or MFP). Labour productivity is a measure of the total gross output (or value added) produced by each worker. MFP is defined as residual economic growth after contributions from capital, labour and other identifiable factors have been accounted for. MFP could include technological changes, changes to the work organisation or any other non-measured input.

3.9

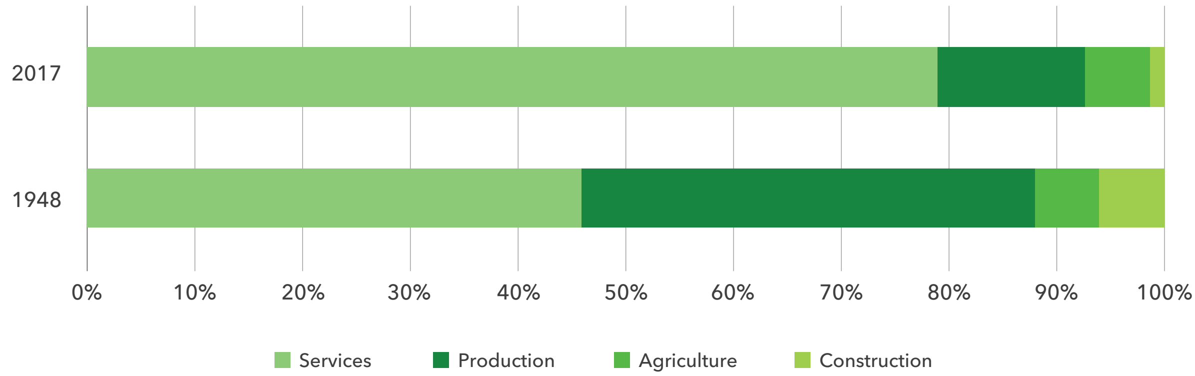
There are difficulties in the measurement of contributions to economic growth since, although labour inputs are reasonably reliably gauged, both capital and output are difficult to quantify due to many sources of variability. For example, both inputs and outputs can change in quality. There is also variation in the intensity of capital use, and investment can be hard to measure when the cost of capital changes as, for example, has been happening with the price of ICT capital.

3.10
Outputs can be even more difficult to measure in industries where innovation is rapid. The value of output will also be affected by price inflation, which might lead to output overestimation if not properly accounted for. On the other hand, Hausman[16] cautions of overestimating inflation in high innovation industries as this leads to real growth being underestimated.

3.11
Measuring output is particularly difficult for new products or services (and even more so for intangible products delivered by ICT such as music and video streaming). The national accounts were framed in the 1930s and 1940s which, as shown in Figure 10, was a period where the economy had a very different industrial makeup to the way it is now.

3.12
The pathbreaking nature of innovations in areas like ICT presents much more difficulty in terms of estimating their value to consumers. Nordhaus[17] suggests many examples where the measurement of prices does not take into account the growth of volume or quality of the output as a result of innovation. They include artificial light (the price element of which was overestimated by a factor of at least 10,000), improved health and wellbeing as part of the output of medication, radio and television programmes, passenger journeys generated by the invention of the steam locomotive and consumer surplus due to the greater convenience of zip fasteners over buttons.

Figure 10: Change in the industrial makeup of the UK economy: percentage of UK GDP



Source: Index of Services and Second Estimate of GDP, ONS

3.13
The inherent problems with measuring the changes in quality of inputs and outputs present a barrier to defining the causes of growth.

Encouraging growth and General Purpose Technologies

3.14
Spill-over benefits of an investment are benefits felt by parties other than those parties which were originally intended to be the beneficiary of the investment. They can occur within a firm, industry or whole economy. They are large contributors to economic growth, however are hard to capture in growth accounting.

3.15
Governments can encourage growth by supporting or facilitating the conditions which are associated with innovation. Whilst the role of the institutions in growth might be downplayed within economics, they are in fact vital in setting up a framework (organisation, tax, regulation etc) for successful long-term growth. The essential features of this approach are:

- Encourage Investment in research and development
- Invest in human capital. The rate of return from human capital investment (that is improving the skills and wellbeing of the potential working population) can be higher than the rate of return to investment in physical capital[18]
- Encourage investment in both human and physical capital which can generate spill-over effects in other firms and sectors so that the social rate of return from such investments is significantly larger than the private rate of return to whoever does the investing
- Protect property rights and patents and encourage new businesses as a source of innovation in both products and ideas

3.16
To a large degree, this is what the UK government is currently doing through the Industrial Strategy. It is an overarching approach to stimulating a range of industries and driving productivity. It includes an innovation fund intended to drive adoption of new digital technologies, and catalyse productivity growth. The goal is for the UK to be the most innovative economy in the world by 2030.

The impact of ICT on productivity and growth

3.17
The literature consistently finds that the use (as opposed to production) of ICT has a positive impact on productivity at an economy and firm level.

3.18
According to a range of studies, up until 2000 a large part of the growth in US productivity was derived from the ICT producing sector, but after 2000 most of it was derived from other sectors using ICT both to improve their processes and to develop new products and services[19]. The findings from one of these studies are shown in Figure 11.

Definitions

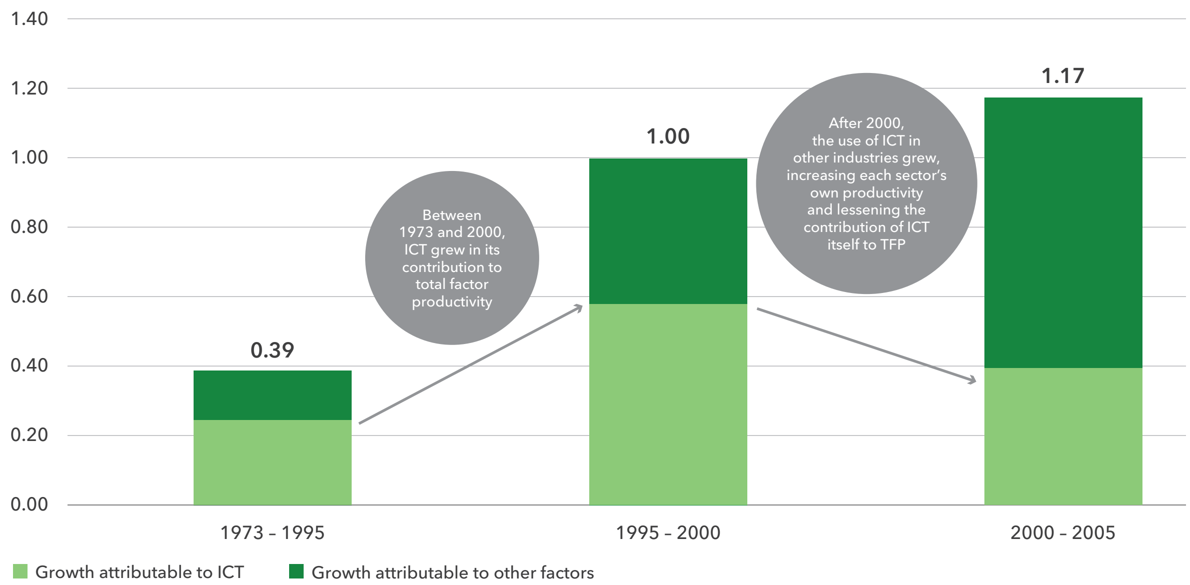
General Purpose Technologies (GPTs) are technological advances that have implications across a wide range of industries, become widely adopted, improve in quality and reduce in cost over time, and lead to innovation across a wide range of industries. When a disruptive GPT is introduced, institutions can play a vital role in designing structures and regulations which reflect the preference of societies: embrace or resist the change.

It is becoming increasingly accepted that ICT is the third GPT (after the steam engine and electricity), although the full impact of GPTs can take decades to feed through.

Spill-overs include (within a company) technology enabling better worker productivity, or (across companies) improvements in one company enabling better quality of service to others.

If new capital equipment requires a particular set of skills in the workforce who are using the equipment, the returns to both the equipment and the enhanced skill are dependent on each other. **Without the worker skills the machine will not deliver. But without the machine the workers' extra skills make no contribution to output.** New equipment can facilitate new ways of organising work which is more efficient, but which may be unrelated to the machine itself.

Figure 11: United States growth rate of total factor productivity



Source: Jorgenson, D.W., Ho, M.S., and Stiroh K.J. (2008), A Retrospective Look at the U.S. Productivity Growth Resurgence, Journal of Economic Perspectives, 22(1):3-24

3.19
In the EU, the use of ICT in other industries and services has been described as a key explanation for differences in productivity performance across OECD countries[20]. Post-1995 the EU did not see the acceleration in productivity (per worker per hour) that the US saw, implying that a larger part of observed growth in the EU could be accounted for by increased labour inputs. The EU has seen lower ICT investment in services than the US, and key service sectors responsible for the EU-US labour productivity gap are precisely those which have been identified in the US as deriving large productivity gains from ICT use: the retail and wholesale trade and financial and business services[21].

3.20
At a firm-level, businesses from eight OECD countries which used ICT more intensively were found to innovate more[22], and US firms were more adept than those in Europe at implementing organisational changes that maximised the impact of ICT on productivity[23]. Among the firm-level studies are one from Italy which suggests that every €1 spent on ICT investment generates a return of €45[24]. It is also possible that ICT use might induce spill-overs, for example other sectors benefiting from ICT investment.

3.21
Finally, there is clear evidence that the full benefits of ICT can only be realised where there is also investment in complementary assets and systems, such as human, organisational and managerial capital[25].

04

The UK productivity problem and digital solution

4.1
The UK has a widely reported 'productivity problem', with many firms' productivity lagging behind the average. It is a global finding that SMEs are less productive than larger firms, however UK SMEs are even less productive than those in other developed countries. 90% of UK firms in the bottom 10% of productivity are micro businesses. Also, as can be seen in Figure 8, turnover per worker in the UK rises as firm size increases.

4.2
There is much evidence of lower digital skills by those in management positions within SMEs. It is therefore unsurprising that adoption of digital technologies lags behind in SMEs compared with larger firms. For example, across all SMEs only 71% use BACS payments compared with 95% of large firms.

4.3
Embracing digital can enable productivity gains by minimising errors, saving time, and through improved functionality. Therefore, as SMEs lag behind in productivity and digital, the two are linked and increased adoption of digital should thus assist in narrowing the productivity gap between SMEs and larger businesses. Since growth depends upon productivity, the low standards of SMEs negatively impact the growth of whole economies and, consequently, the living standards of those living in those economies. Were SMEs to adopt and use more digital technologies, their productivity might improve resulting in greater economic growth.

UK and SME productivity

4.4
UK firms are particularly unproductive relative to firms in other developed countries. Globally, SMEs are less productive than larger firms, however UK SMEs are some of the least productive.

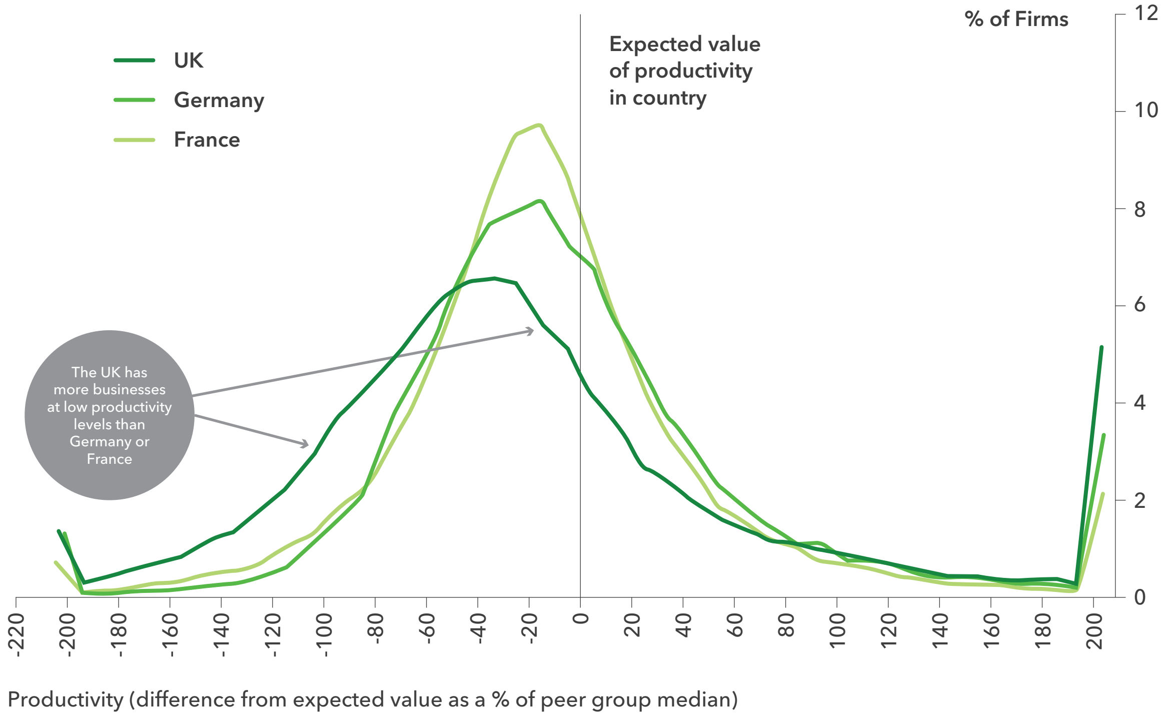
4.5
The gap in productivity between the top and bottom 10% of firms is 80% larger in the UK than it is in the US, France and Germany[26]. A much larger proportion of UK businesses fall into the "long tail" of low and slow growing productivity, as shown in Figure 12.

4.6
In the UK, the productivity difference between SMEs and larger firms is bigger than in other developed economies, and 90% of firms in the bottom 10% of productivity performance are micro firms. UK SMEs also typically have poorer management skills which are essential to growth and innovation.

SMEs and ICT adoption

4.7
ICT adoption, a key driver of productivity, is found to be particularly low in UK firms relative to other developed countries, despite adoption having risen in recent years.

Figure 12: UK, Germany and France firm-level productivity (2013)



Source: McKinsey and Orbis (2013), retrieved from Bank of England 'The UK's Productivity Problem: Hub No Spokes', 2018

4.8

There is consistent evidence that SMEs consistently lag behind larger firms in the adoption of ICT of all types. The main reasons for this are their limited financial, organisational and human capital resources[27]. **Across all firm sizes, there is evidence of a clear relationship between ICT adoption, change in processes and firm performance.**

4.9

A quarter of SMEs owners and managers reported that they lacked basic digital skills[28], and the 2017 Lloyds Bank Business Digital Index (Table 4) found that only 59% of small businesses and charities had capability in all five areas of digital basic skills[29]. Use of these skills can bring numerous benefits, which is why the introduction of digital technologies needs to be accompanied by staff and management training if the benefits are to be realised.

Table 4: Basic Digital Skills Framework: five areas of capability

Digital skill	Explanation
Managing information	Find, manage and store digital information and content
Communicating	Communicate, interact, collaborate, share and connect with others
Transacting	Purchase and sell goods and services; organise your finances; register for and use digital government services
Problem solving	Increase independence and confidence by solving problems using digital tools and finding solutions
Creating	Engage with communities and create basic digital content

Source: Lloyds Bank Digital Skills Index 2017

4.10

Innovation surveys conducted by the European Commission found that UK SMEs rank 18th out of 36 countries in the adoption of new technology[30]. However, there is evidence that UK SMEs are beginning to use ICT, at least for standard back office functions, as shown in Table 5.

Table 5: Use of digital technology by UK SMEs, 2015

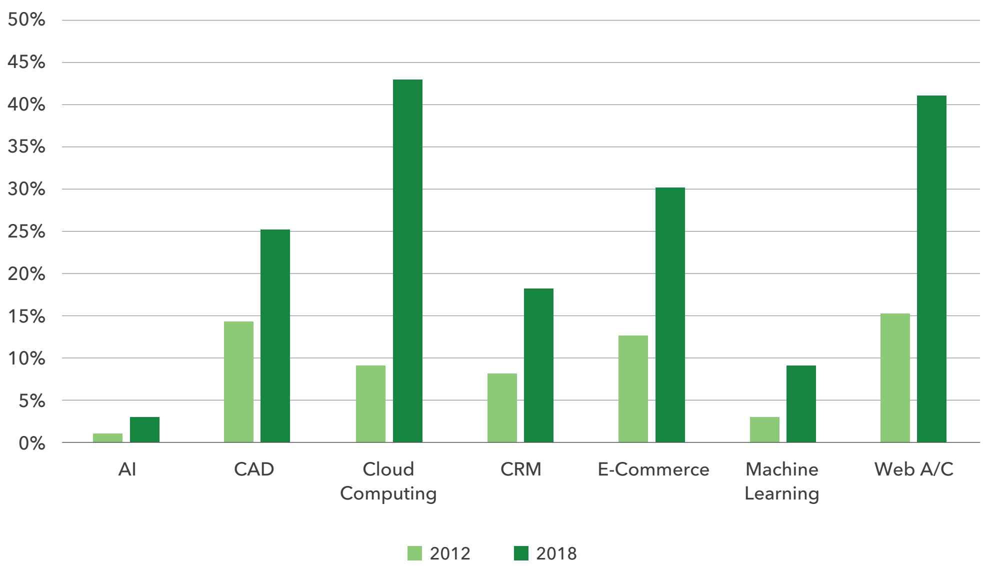
Activity	All SMEs	No employees	1-9 employees	10-49 employees	50-249 employees
Online banking	82%	81%	86%	89%	91%
Paying bills online	78%	75%	85%	85%	89%
Paying taxes online	75%	73%	82%	82%	78%
BACS payments	71%	67%	82%	84%	95%

Source: BMG Research and Durham University (2015) Digital Capabilities in SMEs: Evidence Review and Re-survey of 2014 Small Business Survey respondents. BIS Research Paper Number 247. London: Department for Business, Innovation and Skills.

4.11

A study looking into the use of different types of digital technologies found that, amongst micro businesses, cloud computing and web-based accounting are the most commonly used (Figure 13). The same study reported that around a quarter of micro businesses only used one type of digital technology.

Figure 13: Digital adoption in micro businesses



Source: ERC Research, The State of Small businesses in the UK, 2018

4.12

These adoption rates are much improved compared to five years ago. In 2012, web based accounting software, CAD and E-Commerce were the most commonly used digital technologies, but only approximately one in seven micro businesses used these technologies. Fewer than one in ten firms were using cloud computing, and other advanced technologies were even rarer. This highlights the difficulty in predicting speed of take-up of technological advances. Interventions such as MTD that are discussed later in this section could therefore catalyse companies into making this jump, and thus realising the benefits (even if after an initial adjustment period).

The impact of ICT on SME productivity

4.13

ICT adoption helps improve productivity in a huge number of ways. The main savings are time savings, where the use of technology can decrease the time taken to do a task, leaving more time to spend on other productive tasks.

4.14
The extent to which an SME might benefit from a type of digital technology will depend upon its sector, as each industry and product will have varying requirements for ICT.

4.15
In general, SMEs that use ICT improve their productivity as a result of improved efficiency and saving costs. The achievement of lower costs comes about through reduced staffing, improving document handling processes, using financial and accounting applications. E-commerce can also streamline purchasing and sales processes. Other potential benefits include inventory management, logistics, reduced errors and access to global suppliers[31]. Figure 14 displays the benefits of digitisation, along with some of the barriers to digital adoption that businesses (particularly SMEs) face, and some ways in which institutions might be able to mitigate these barriers.

Figure 14: Benefits of and barriers to digital adoption

Benefits of digitisation	Barriers to digitisation	Ways to overcome barriers
Efficiency	Limited access to cash	National superfast broadband connection*
Time savings	Transition costs	WiFi offered on public transport
Productivity	Managerial barriers	Educate firms on the benefits of digitisation
Decreased errors	Security of information concerns	Training and support on digital for young companies
Environmental	Lack of awareness of benefits	Overcome cultural barriers to adoption
Increased access to global suppliers/buyers		
Spillovers		

** The UK only came 35th of 200 in the Worldwide Broadband Speed League 2018 // UK was 17th of EU 28 for the share of businesses with either super- or ultra-fast broadband in 2016 Sources: Elixirr, 2015, SMEs and Digital skills in the UK Digital Economy; Cable, 2018, Worldwide Broadband Speed League 2018; ONS, 2016, Economic output and productivity measures*

4.16
Several studies have looked into quantifying the productivity benefits of digital technologies. The Enterprise Research Centre found that, depending on the type of technology adopted, there was between 7.1% (Computer aided design) and 18.4% (CRM software) increase in sales per employee[32].

Another study found that the time spent on routine administration and compliance tasks represented a potential output cost of £40 billion per year[33]. The same study found that firms that did not use financial management software had on average costs of accounting around 3.5% of turnover compared to those firms which were using fully digital solutions and had accounting costs of around 2.5% of turnover. In other words, adopting FMS will save an average firm 30% compared to manual accounting.

4.17
In terms of the type of ICT use, UK firms have found that the use of online analytical services increases productivity by on average 8% compared with firms that do not use such services[34]. A study of 18,000 US manufacturing businesses found that the introduction of data driven decision making led to productivity improvements of around 3% (in addition to any productivity improvements from more general ICT adoption)[35].

Adoption of digital technologies

4.18
The adoption of digital technologies by one person does not prevent another person's adoption of that technology. Therefore, any benefits realised from adoption can be considered truly additional to the economy.

4.19
One of the key features of the digital economy is that one person's consumption of the good or service, be it content, data or otherwise, does not prevent another's consumption of the same product. This means that adoption of a technology will not prevent another person's adoption of the same technology, and therefore any benefits brought by adoption are truly additional to the economy.

4.20
Currently, direct adoption of advanced digital technologies such as AI is mainly from the 20% of firms which are leading in their industries, which are usually large firms. The greatest returns are from cognitive technologies – AI and big data analytics – which have been estimated to increase output per worker by $1.90 for every dollar invested. The same investment in robotics increases output per worker by $1.10.

Making Tax Digital

4.21
Many businesses currently file their VAT returns using the HMRC website, either directly or via an accountant. While the majority file quarterly, it can be done monthly, quarterly or yearly. Record keeping varies from business to business, from using digital bookkeeping software through to using spreadsheets, hand written records, or the traditional 'shoebox method' of storing receipts until the VAT return is due.

4.22
Making Tax Digital (MTD) is a key part of the UK government's plan to make it easier for individuals and businesses to keep on top of their tax affairs and to make the UK one of the world's most digitally advanced tax administrations. Starting with VAT, businesses will be legally required to keep a digital record of their transactions and to submit tax returns at least quarterly using MTD-compliant software from 01 April 2019. This software comes in two main forms: digital bookkeeping software that has a built-in API link to facilitate the submission of the return information from within the product, or 'bridging' software, which includes the API link, and which digitally links with non MTD-compliant software or spreadsheets used for bookkeeping purposes or which contain data digitally extracted from disparate sources.

4.23
HMRC believes that by transitioning businesses to digital record keeping, MTD will decrease the level of manual record keeping and introduce time benefits to businesses from this more efficient method of tax submission. However, there are likely to be varying business costs associated with the changes, for example a business who does their taxes on paper would need time to order their accounts into a digital format, and would need time to receive training on the software. Additionally, the software itself is an ongoing cost; current mainstream providers range from around free to £30 per month, depending on functionality.

4.24
Initially, only the 1.2 million VAT registered businesses with annual VAT taxable turnover above the £85,000 threshold will be required to comply with the MTD for VAT initiative in 2019. It will not affect the 3 million unregistered Sole Proprietorships or Partnerships that are estimated by the ONS (Figure 2), unless they chose to voluntarily join.

4.25
A private pilot of the MTD programme was launched in April 2018, before expanding and being made public in October. The pilot continued to grow for the remainder of the year, by which time over 600,000 firms with straight-forward and up-to-date affairs were eligible to join. The pilot rollout continued until midway through February 2019, at which point all affected businesses were entitled to join. It should be noted that 36,000 eligible businesses with 'more complex requirements' do not have to comply until October 2019.

4.26
The government has stated that if a registered business is trading below the VAT threshold, they can still sign up to MTD. There is no quality evidence base from which to predict how many businesses may choose to do so.

Open Banking

4.27

Open Banking has the potential to be hugely beneficial to SMEs. It enables the integration of banking with other digital technologies such as Financial Management Software, making tasks which require both services more efficient.

4.28

SMEs face four key challenges in relation to their finances: business banking services that do not always meet their needs and which can be expensive, managing cash flow (including problems caused by late payment by customers), administrative tasks around record keeping and taxation and access to borrowing. Open Banking has the potential to generate improvements in all these areas.

4.29

Open Banking has two separate but related origins: the Competition and Markets Authority (CMA) having reviewed the markets for both personal and SME current accounts ordered the eight largest banks in the UK plus Nationwide Building Society (sometimes referred to as the CMA 9) to establish a secure application programming interface (known as an API) to enable customers to share their current account data with authorised third parties. The largest four banking groups hold around 85 per cent of the SME current account market. In parallel the European Union's Second Payment Services Directive (usually referred to as PSD2) required all banks (of any size) to develop mechanisms to allow customers both to share data with authorised third parties and to enable them, should they choose to do so, to make payments via the third-party application.

4.30

The key feature of Open Banking in the UK is that there is a single standard API for all the nine institutions covered by the CMA order. This makes it much more straightforward for companies developing applications as they only have to program their interface with a single API standard to provide services for the vast majority of SMEs[36].

4.31
In the UK a range of services both for individual customers and for SMEs are being developed by a variety of authorised third parties. Specifically, for SMEs they include:

- Account comparison services, which use an individual SME's banking data to make comparisons with the costs and quality of service of other banks. The CMA found large variation in both the costs and the quality in terms of customer satisfaction between different banks' current accounts
- Account aggregation services, allowing SMEs with accounts at more than one bank (estimated by the CMA to be four per cent of all SMEs) to view all their accounts together. In due course it is likely that this type of application will be able to cover borrowing as well as payment accounts
- Integration of banking, invoicing, financial administration, cash flow management, VAT and tax into a single automated package
- The creation of new forms of credit profiling by integrating banking data with other information about a business
- Facilitating access to borrowing for SMEs by providing a matching service for lenders and potential borrowers

4.32
Some of these applications are being developed with support from the NESTA Open Up Challenge, which was launched in collaboration with the CMA as part of the package of remedies to improve competition in SME banking. Others are extensions or modifications of existing financial management or credit broking products.

4.33
As we remain at an early stage of Open Banking, work is ongoing to ensure that the APIs work across a range of banks and products and that they meet EU technical standards. As a result, features are being rolled out gradually to SME customers, but they are likely to grow significantly over the next few years.

05

Modelling the productivity payout

5.1
This report finds that £11.9bn in additional turnover would have been gained by UK SMEs if they had fully adopted Financial Management Software (FMS) in 2018 (the last full year for which business population data is available). The sector that feels the largest potential benefit is Wholesale and Retail and the region is London.

5.2
Looking over the five years 2019-2023, growth in the number of SMEs and their turnover means that a cumulative £66bn would effectively be lost if FMS adoption rates stayed as they are at 40%.

5.3
In 2019, MTD for VAT will catalyse circa 1.2 million firms to adopt one element of FMS: VAT. However, having adopted digital VAT, these firms are likely to adopt other areas of FMS, leading to an estimated annual productivity increase of £6.9bn. Over the five years to 2023, this report estimates that the initiative will catalyse firms to realise £29bn in additional turnover gain.

5.4
As a result of MTD, there might be influences over the natural growth in the adoption rate of unaffected firms – previously 4% per annum. For example, SMEs may have heightened awareness of the benefits of digital accounting by observing the benefits of FMS adoption in the affected firms which might increase their adoption rate. However, affected firms (trading above the threshold) may have had a higher natural adoption rate than others, hence once they comply with MTD the remaining natural adoption rate might be lower than 4%. The model assumes that such positive and negative influences over the natural adoption rate cancel each other out in this scenario, hence unaffected firms still increase their adoption at 4%. This maintenance in natural adoption rate will generate an estimated £17bn in additional turnover gain.

5.5

Additional initiatives, such as an extension of MTD or better education of the benefits of adoption, could realise a best case additional £11bn, bringing the total potential five year benefit to £57bn.

5.6

There are of course a number of barriers associated with adopting digital. The most common is a lack of basic digital skills. The literature suggests that this can be overcome with training, and our case study analysis suggests that many of these barriers are perceived to be greater than they actually are. This is where an intervention like MTD can have positive catalytic benefit; it can compel nervous firms to adopt when they might not otherwise have done so, thus enabling them to overcome the first hurdle and then take advantage of all the benefits. This in turn might lead to further digital adoption beyond FMS, increasing their benefits even further.

The estimated benefits of full FMS adoption by SMEs

5.7

By taking the Business Population Estimate of the number of SMEs in the UK economy and incorporating findings from the literature on the productivity benefits of going digital, the impacts of FMS adoption have been modelled and estimated. The model uses turnover per business as a proxy for productivity. The inputs are 2018 turnover figures and the shape of the output is informed by the collection of evidence in the literature review, which can be found in Appendix C.

Table 6: Estimated increase in turnover for complete use of financial management software in SMEs

	Increase in turnover (£)	Average increase in turnover per business (£)	Average increase in turnover per worker (£)
With no employees (unregistered)	0.6bn	200	200
With no employees (registered)	2.2bn	1,900	1,700
1 to 9	3.9bn	3,400	900
Small	3.8bn	18,000	900
Medium	1.4bn	41,100	400
All SMEs	**11.9bn**	4,400	

5.8
Table 7 splits the turnover increases by region. The model predicts the largest effects of going digital would be felt by London and the South East, with the lowest effect being felt in the North East and Northern Ireland.

5.9
London firms would benefit more than other regions due to the fact that their existing levels of productivity are higher. Even though the model accounts for the fact that London firms are likely to currently have a higher rate of digital adoption than other regions, London will still benefit more from full FMS adoption due to the large number of firms in it and the high productivity of those firms compounding the effect of the input.

Although the North East gets a small proportion of overall benefits, on a per business basis, the model predicts that registered businesses will receive the second-highest average £5,300 each. This figure is driven by the fact that firstly there are very few businesses in the North East (only 162,000), and a very high proportion of these (60%) are unregistered. Of those registered, there is a skew towards larger firms, which leads to a higher per business figure.

Table 7: Increase in turnover by region for registered businesses

Region	Increase in turnover (£)	Average increase in turnover per business (£)	Average increase in turnover per worker (£)
East Midlands	0.7bn	4,400	800
East of England	1.1bn	4,300	900
London	2.8bn	5,700	1,300
North East	0.3bn	5,300	900
North West	1.0bn	3,900	800
Northern Ireland	0.3bn	4,600	900
Scotland	0.6bn	3,600	700
South East	1.5bn	3,800	800
South West	0.8bn	3,700	700
Wales	0.4bn	3,700	700
West Midlands	0.9bn	4,300	800
Yorkshire and the Humber	0.8bn	4,800	900

Totals may not match those in Table 6 for registered businesses due to rounding

5.10

Table 8 splits the turnover increases by sector. The model predicts that the largest increases will be felt by the Wholesale and Retail Trade, Construction, Professional and Manufacturing sectors.

5.11

It can be seen that the Wholesale and Retail sectors benefit the most at £2.8bn, due to their high contribution to SME turnover and productivity. This is also the reason behind the large benefits for the Construction, Manufacturing and Professional services sectors. However, when considered at a per business and per worker level, the Professional services sector does not benefit as much as the others, given that higher existing adoption in Professional Services reduces the per worker and per firm benefits still to be gained.

5.12

Despite Manufacturing and Professional Services receiving similar benefits, there is a large difference on a per-business basis. The driving force behind this is the size distribution of the firms; the Manufacturing sector is weighted to larger firms with only 30% Micro sized, whereas 61% of Professional Services firms are Micro.

What makes up these £11.9bn benefits?

5.13

Ways in which adoption of digital accounting could increase turnover are mainly linked to the time saved in using the application, and the new ways in which that time is spent. This could be on growth strategies, bringing in new clients, team management or training, all of which will increase turnover. There is also less cost associated with a digital as opposed to non-digital accounting process, and these savings can be spent on turnover boosts such as more marketing. We spoke to a number of FMS users about some of the benefits they feel from the software.

Table 8: Increase in turnover by sector for registered businesses

Sector	Increase in turnover (£)	Average increase in turnover per business (£)	Average increase in turnover per worker (£)
G - Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	2.8bn	7,600	1,300
F - Construction	1.4bn	4,200	1,200
C - Manufacturing	1.1bn	8,100	800
M - Professional, Scientific and Technical Activities	1.1bn	2,300	700
N - Administrative and Support Service Activities	1.0bn	4,600	800
J - Information and Communication	0.7bn	3,200	1,000
H - Transportation and Storage	0.6bn	5,700	1,200
S - Other Sectors*	2.4bn	2,800	300

Totals may not match those in Table 6 for registered businesses due to rounding

Testimonials

I enjoy the peace of mind from knowing that I have the latest version every time I use it. For example, software glitches are constantly updated or if VAT rates changed overnight, I would see that the very next day.

- Lighting & Furniture, Retail

I am near retirement, so am not always close to the restaurant. The software allows me to check my accounts from a beach in Cornwall or wherever I am at the time. I use the business snapshot a lot to get lots of information quickly which is really useful.

- Hotel, pub and restaurant

Time wise there is a saving. Once the data is in system, there is no extra time going in to find documents. The old system needed loads of bank statements, invoices etc which would be time consuming to find. Now it's all there.

- Tax compliance and accounting provider

The big benefit is the time saved in things like tracing invoices, highlighting errors, and chasing things more easily. I am also able to give much better customer service since the software produces more professional looking invoices. The reporting tools are really great; I have much better view of the cash flow, and can easily look straight at profit and loss. The software also talks to other digital applications that I use for the business such as Mailchimp (Email marketing) and Insightly (CRM). The integration is seamless so I save time on all those platforms too. Being able to run these applications from anywhere is a really good thing for a small business.

- Wildlife and biodiversity products, e-commerce

5.14

It is clear that time saved will make up a significant proportion of the £11.9bn potential benefits. However, it is hard to quantify the exact amount as the proportion will vary across business size, industry (where the business has a lot of transactions like in hospitality or few like in consulting), current level of digital adoption and how businesses value their time. Some research attempting to estimate the value of such time savings include:

- Federation of Small Businesses[37] (2018) estimates that UK SMEs spend 95 hours (roughly 12 working days) per year on tax compliance. This tallies an average of £5,000 per year. VAT was considered one of the most time-consuming taxes to handle
- NSBA[38] (2014) reported that most small businesses spent 41 hours a year or more on tax preparation, with 40% spending over 80 hours, 18% spending 41 to 80 hours, 15% spending 21 to 40 and only 28% spending less than 21 hours. This implies an average weighted time spend of 50 hours
- Sage[39] research (2017) estimated that small businesses spend 120 hours per year on admin tasks, of which accounting would be some proportion. It found that 5.6% of staff time was spent on back office tasks and that if productivity increased by the same amount then £34bn could be added to annual UK GDP

5.15

What is not accounted for in the £11.9bn is spill-over benefits occurring as a result of full FMS adoption, for example if a firm was incentivised, after observing the FMS benefits, to adopt other digital technologies such as AI which have their own productivity benefits. These are not estimated as they can take much longer to occur, and the pace at which these are realised will depend upon the firm, industry, cashflow etc

How do the benefits of FMS adoption compare to benefits of all digital adoption?

5.16

Digital accounting is only one element of digital adoption. Other elements include cloud computing, AI, machine learning etc. Since adoption of some of these elements is so low, for example AI adoption is less than 5% in micro businesses (Figure 13), the evidence base for the benefits of adopting these technologies is small. Some of the literature findings of the benefits are as follows:

- A recent study by Oxford Economics[40] for Virgin Media found that if lower performing firms could shift their digital technology use up to the standard of leading firms, some £92 billion could be added to UK output
- PWC[41] estimate that AI could increase UK productivity by up to 14.3% by 2030 and UK GDP will be 10.3% higher – the equivalent of £232 billion – than today
- The Confederation of British Industry[42] (2017) stated that low technology take-up and poor management practices are driving the UK productivity problem and that tackling these problems could add more than £100bn to UK GVA

5.17
Given the lack of data, it is difficult to put the estimated £11.9bn potential additional benefits of FMS adoption into the context of wider digital adoption with much exactness. However, it can be seen from Figure 13 that FMS is one of the technologies that is currently one of the most prevalently adopted in micro businesses. It is therefore arguable that FMS presents one of the most realistic and attainable routes into digital adoption, catalysing further spill-over, and beginning the realisation of even wider economic benefit.

The impact of MTD on SMEs

5.18
The above projected £11.9bn potential benefits of FMS adoption refers to all 5.7m SMEs fully adopting FMS. MTD for VAT is an initiative which causes 1.2m firms to adopt digital submission of VAT, which is only one element of all FMS. Therefore, of the £11.9bn, only a portion of it will be attributable to MTD-affected firms going digital with their VAT.

5.19
However, it is reasonable to assume that subsequent to MTD, affected businesses in turn adopt all benefits of FMS. Businesses affected by MTD could realise £6.9bn of the £11.9bn total potential productivity gain. it is easy to see how this could happen; many of the government approved software packages such as QuickBooks, Xero and Sage offer a wide range of digital technologies and functionalities. It is then a relatively easier migration for those firms to then go on to use other elements of the software. This expansion to using all accounting software features is an example of an immediate spill-over benefit of MTD, which is included in the £6.9bn figure.

5.20
Table 9 shows the distribution of the £11.9bn for different business groups, highlighting the share of the benefits which MTD-affected businesses would receive if they fully adopted FMS.

Table 9: Business group breakdown of potential benefits to be gained from FMS adoption

Group	Number of businesses (m)	Potential turnover benefits from FMS adoption (£bn)
All businesses	5.7	11.9
Unregistered businesses	3.1	0.6
Registered businesses	2.6	11.4
Voluntarily registered businesses	1.4	4.5
Compulsory registered (MTD mandated) businesses	1.2	6.9

5.21
The table shows that if the 1.2 million MTD-affected firms had fully adopted FMS, they would have realised £6.9bn of potential benefits (2018). However, it is crucial to note that MTD only compels affected businesses to go digital with their tax rather than all aspects of FMS. If these businesses limit their digital adoption to just the tax element, their benefits would only be a portion of the £6.9bn.

5.22
If firms did limit their adoption to just the tax element, the benefits they get could be outweighed by the costs associated with the adoption such as the cost of the software (currently ranging between free and £30 per month depending on feature set). This explains why HMRC have stated that affected businesses are likely to incur net costs, which would follow given that the benefits of the digital tax element alone are only a proportion of the projected £6.9bn. However, this report finds that if firms extend their digital use of accounting beyond the tax element, they will realise the full £6.9bn benefits of FMS which will more than outweigh the costs of adoption.

Potential benefits from FMS adoption over five years

5.23
To model the potential benefits over five years, the UK SME count and turnover has been assumed to continue to grow between 2019 and 2023 at an average yearly rate the same as the average of the last 10 years. With this growth, the potential benefits to be gained from full FMS adoption also increase. If FMS adoption rates stayed at 40%, firms would have a cumulative £66bn (in 2018 prices) still to be gained from FMS adoption over the time period (or in other words, £66bn would have been lost due to insufficient FMS adoption).

5.24
However, there is a natural growth in FMS adoption rates due to naturally increasing awareness of the value of FMS, naturally increased digitisation of society, births of digitally-minded firms etc. The literature implies that FMS adoption has increased in micro businesses by approximately 4% per annum in recent years[43]. Sources reporting adoption of other technologies suggest that adoption rates remain increasing at a fairly stable rate until they reach 80% where the increase tails off[44].

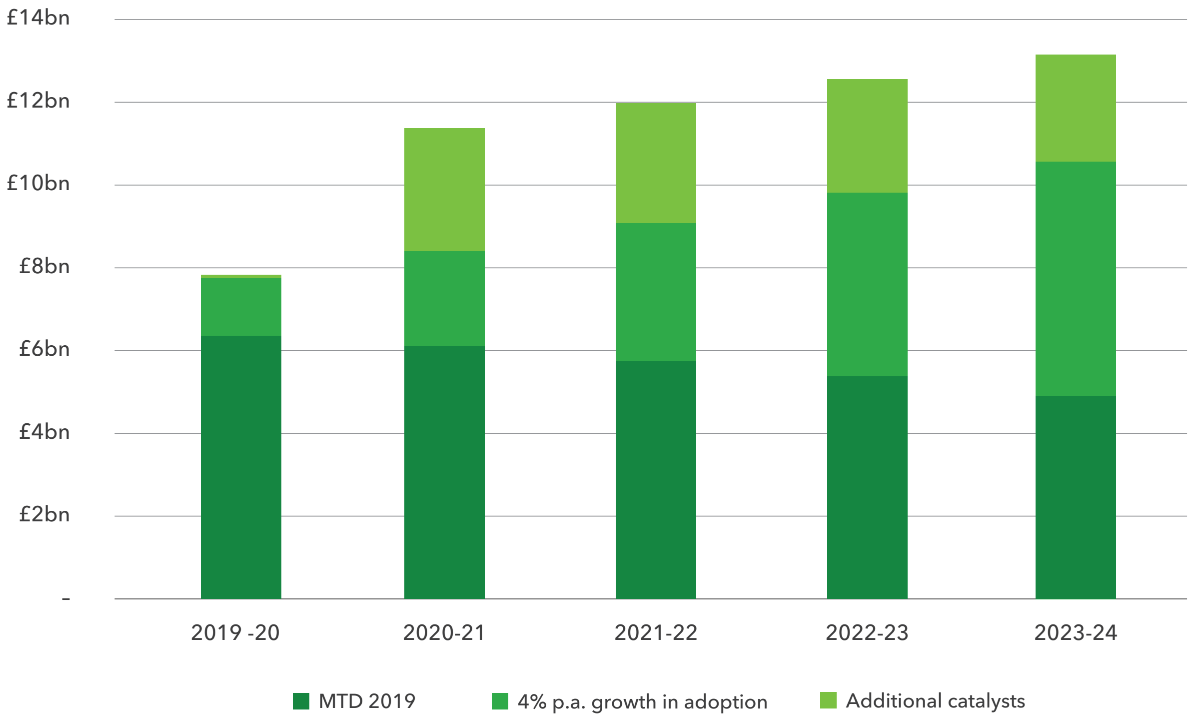
5.25
To estimate the impact of the introduction of MTD for VAT over time, the model assumes that firms affected by MTD realise the full benefits of FMS in FY2019. In this MTD scenario, there might be influences over the natural growth in the adoption rate of unaffected firms. For example, they may have heightened awareness of the benefits of digital accounting by observing the benefits of FMS adoption in the affected firms which might increase their adoption rate. However,

affected firms (trading above the threshold) may have a higher natural adoption rate than others, hence once these are mandated the remaining natural adoption rate might be lower than 4%. The model assumes that such positive and negative influences over the natural adoption rate cancel each other out in this scenario, hence unaffected firms still increase their adoption at 4%. The adoption patterns equate to additional benefits of £17bn over the time period, on top of those benefits which MTD would bring. Overall, MTD would help push firms to realise a total £46bn of the potential £66bn benefits between 2019 and 2023.

5.26
However, this still leaves a shortfall of £20bn over the time period. More interventions are needed in order to push more firms to adopt FMS and thus negate some of these losses. Figure 15 models the impact of potential additional interventions. Although it should be noted that none are yet a reality, they are all in active planning phases by the relevant organisations, and therefore provide a practical roadmap to push towards as much of the full £66bn total potential benefit as possible.

- HMRC Ministers have stated they may consider a further rollout of MTD from 2020[45], which could be an extension to up to 1 million businesses which are voluntarily VAT registered and are trading under the threshold. Assuming that none deregister and that these firms fully adopt FMS in 2020, this could bring additional benefits of £8bn 2020-2023. If HMRC extended MTD to the unregistered self-employed and people with income from property[46], this would increase these benefits even more
- There could be initiatives which would increase the natural adoption rate of unaffected firms to higher than it would have been otherwise. For example, the integration of open banking to FMS might provide another gateway through which firms might discover digital accounting and its benefits. Alternatively, providers could increase the level of training on use of the software, breaking down some of the potential barriers to adoption. Finally, better education on the benefits of adoption in general could lead firms to take the initiative to adopt themselves. These could bring £2.6bn of additional benefits
- Finally, if these two initiatives happened simultaneously, a potential £11.5bn could be recovered. This is less than the sum of the two initiatives given that there is overlap in some of the effects

Figure 15: Modelling additional catalysts towards FMS adoption



Costs of and barriers to FMS adoption

5.27
There is much debate over the size of costs to firms in digitising their tax. Aside from the costs of the software, costs will vary significantly by business. For example, a business might already use MTD-compatible software to keep their accounts and submit their VAT, hence the cost impact of MTD will be very small on these firms. On the other hand, there will be many businesses who have never used software before, hence might incur training costs. We spoke to a number of SMEs who used FMS about some of the costs that they faced with their FMS products.

5.28
Interestingly, all the firms we spoke to disagreed that there were many costs associated with training on the software, saying that their package was so intuitive they took practically no time to pick it up.

5.29

There are ways in which these costs could be mitigated. If FMS providers offer effective training on using their software, transition costs in terms of time investments might be lessened (as was the case in all of the case studies). This training could come in the form of onboarding videos, FAQs and responsive helpdesk options. There have also been expectations by government that the software industry will provide free entry-level MTD software, for those with the most basic of bookkeeping requirements, which would be particularly well received by smaller firms. Firms can also help themselves by making sure that they are keeping their books in a format which is compatible with the software they are using. Finally, as the FMS market becomes more competitive, businesses will be able to choose from more options such that they use a software which suits their business and industry.

5.30

We also asked our case studies about barriers (aside from costs) to taking up digital accounting or indeed any digitisation, and ways in which institutions could help firms overcome these barriers. Some of the thoughts are outlined in the boxes below.

Testimonials

I think that the major barrier companies face is a lack of experience, lack of awareness of the benefits, and a fear that it will cost a fortune. MTD will push people to realise that those barriers don't exist.

- Wildlife and biodiversity products, e-commerce

There's definitely data security paranoia, particularly if you handle sensitive information; "I've sent something out into the ether and now there's no going back". With the number of data leaks that happen all the time, you can see why people would be put off.

- Lighting & Furniture, Retail

We are not a digital product but there are so many ways in which digital helps our business, from the website to FMS to CRM to social media. One barrier could have been that we did not know which systems to use or how to use them in the best way. We use a business support company who check that we are using the best technology for our business. Having digital support like that is really helpful.

- Wildlife and biodiversity products, e-commerce

I think it's a jargon thing. What is taxable, what isn't, what types of VAT codes should be applied to transactions, the difference between '0% VAT' and 'No VAT', reduced rates, VAT exemptions, non-tangible bonuses, etc. Everyone just wants a simple yes or no, but it seems like the whole process is only for accountants. There are some online support communities which are great but sometimes I have to search through a thousand responses, half of which are not helpful, to find a useful one. The communities would be much more helpful if the quality and accuracy of the information was vetted or curated in some way.

- Lighting & Furniture, Retail

View from a tax compliance and accounting partner

We spoke about MTD, Financial Management Software, and how clients are advised on these issues.

When asked about whether clients were worried about MTD, he replied that his clients felt there was no point in being worried; it was happening and they have to deal with it. Some of his clients were only having to change the software they used to an MTD-compatible one and so were finding the prospect less daunting. Others were going through much more significant changes to their processes, migrating from an almost non-digital system to a fully encompassing accounting software.

When asked about the benefits of digital accounting, he said that there are time saving benefits for sure. Once the data is in the system, there is no time spent on going through old papers to find the relevant documents. This is compared to the old system where businesses would have a multitude of bank statements, invoices etc. which would be time consuming to find. With FMS, these are all in one place.

However, the 'right' software package would depend on the client.

06

Conclusion

6.1
The introduction of Making Tax Digital for VAT (MTD) in April 2019 may present challenges for some SMEs; but this report has shown there is also a significant opportunity that ought to outweigh any costs. The overwhelming majority are likely to take the opportunity to digitise their operations to a far greater degree than required in the legislation.

6.2
On its own – if SMEs do indeed take up this opportunity to realise all the benefits of accounting software rather than only the features needed for narrow compliance – MTD is set to catalyse an immediate annual benefit of £6.9 billion.

6.3
The spill-over of benefits from the introduction of MTD to accounting software isn't the only avenue to a productivity payout for affected SMEs. Having adopted the many digital processes on offer in fully-featured accounting software: business insight; cash-flow and workforce management; and automatic expense and mileage tracking to name but a few, SMEs are likely to have increased confidence in digital processes, and increased understanding of how digitisation can benefit their business. Businesses may go on to realise far more than the average £4,400 productivity payout from adopting accounting software. The MTD catalyst has the power to drive adoption of even more digital software and processes such as marketing and recruitment, and an even greater resulting productivity payout – albeit over an extended time period.

6.4
Of course, a number of businesses are unaffected in this first – and only confirmed – iteration of MTD for VAT. However, it is reasonable to assume that unaffected businesses benefit from spill-over as well. As peer businesses that are affected develop increased confidence and understanding of digital, so businesses unaffected by MTD will be incentivised to try adopting digital processes for themselves. There will be an uptick in digital adoption driven by the SME community itself.

6.5
Over the five year period to 2023, as a result of MTD catalysing adoption of accounting software, we will therefore see an annual productivity payout of £46 billion. But there's more available.

6.6
This report presents a roadmap to realise a further £11bn benefit that would otherwise be lost over the next five years by investigating additional measures that could drive digital adoption more completely and quickly, with the same catalytic effect as MTD for VAT:

- If government rolls out additional elements of MTD, more businesses will be affected by MTD and the catalytic process described above will occur afresh
- If the accounting software industry drives adoption of Open Banking this will provide an additional avenue for generating awareness and confidence in accounting software. Awareness is driven because banking is the most common digital activity for SMEs, with 82% of all SMEs checking their account online. Confidence is driven because online fraud is becoming increasingly common, so consumers are looking for the increased security offered by Open Banking. The catalytic effect is clear
- If SMEs collaborate with the accounting software industry to deliver on any training and support needs. SMEs would need to play their part by helping craft the right service and making use of it. Clearly industry must deliver the service. This would act as a catalyst because by far the most significant barriers identified in this report is lack of access to training. Two in five small business owners do not have all five 'basic digital skills' needed across all software platforms such as 'finding information' and 'solving problems'

6.7
The reason for the identification of these particular measures and this roadmap is that they are realistic and achievable. This is not an abstract route to an unassailable figure. All these measures are already on the agendas of the relevant organisations, and simply need following through.

6.8
By following this roadmap, UK SMEs can realise an additional productivity payout of £11 billion. This represents a total of £57bn over the five-year period.

6.9
This productivity payout is both attainable, and too much to lose. The onus is also government, industry and SMEs to collaborate to overcome the hurdles to digital adoption. Because the £57bn could be just the start. Spill-over can continue. Digital accounting, to digital marketing, to AI. The potential benefits are almost endless.

07

Definitions

SME	Small and Medium-sized Enterprises, defined as any business employing less than 250 workers
MTD	Making Tax Digital, an intervention by the UK Government to increase digital tax submission by businesses. MTD for VAT is the first wave of the initiative, and is the focus of this report
Employment	The total number of workers (people in some form of employment) including those people working for a business, owners, partners and the self-employed. If you are in employment, then you are deemed 'employed'
Employee	People working for a business, but excluding owners and partners. They have an employment contract and benefit from sick pay
VAT	Value Added Tax, or consumption tax, charged at 20% of the 'value added' to a product throughout its production
PAYE	Pay As You Earn, a system whereby an employer will pay an employee's income tax directly to HMRC
Turnover	The amount of money taken by a business in a given period of time ICT Information and Communication Technologies, referring to digital technologies and industry
GPT	General Purpose Technology, referring to technologies which will affect multiple industries, regions and economies
Spill-over	Referring to the impact that an improvement (such as an investment or increased productivity) in a certain area has on areas outside the area of focus, such as in another industry or sector
FMS	Financial Management Software, software which enables the user to digitally perform their accounting functions including: cashflow, management reporting, analysis, budgeting, VAT returns, income tax, payroll etc.
BACS	A system responsible for clearing direct electronic payments between bank accounts
API	Application Programming Interface, a mechanism for information exchange between two separate pieces of software

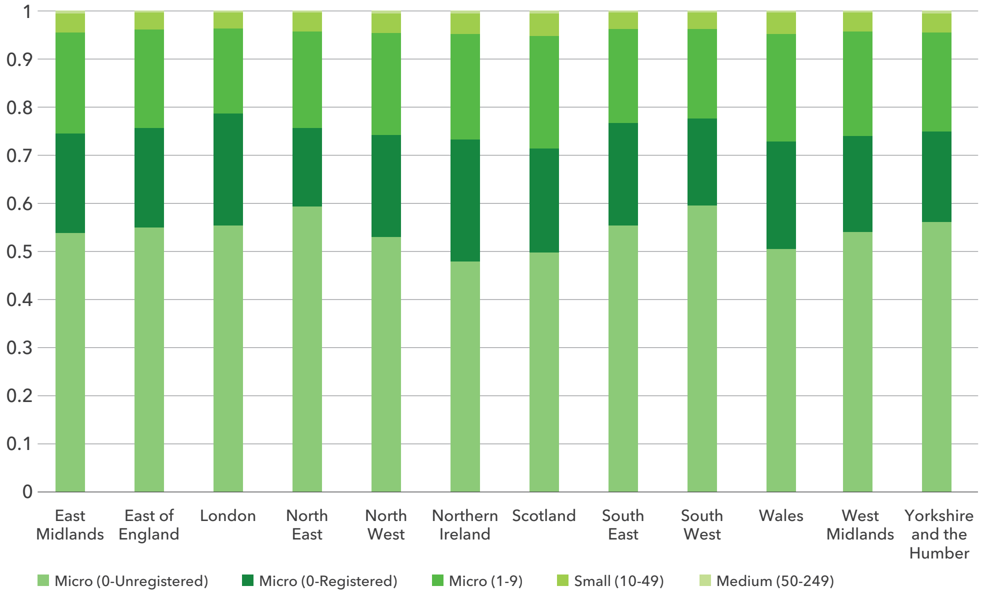
08

Appendix A:
Further illustration of the UK SME economy

SMEs by region and size

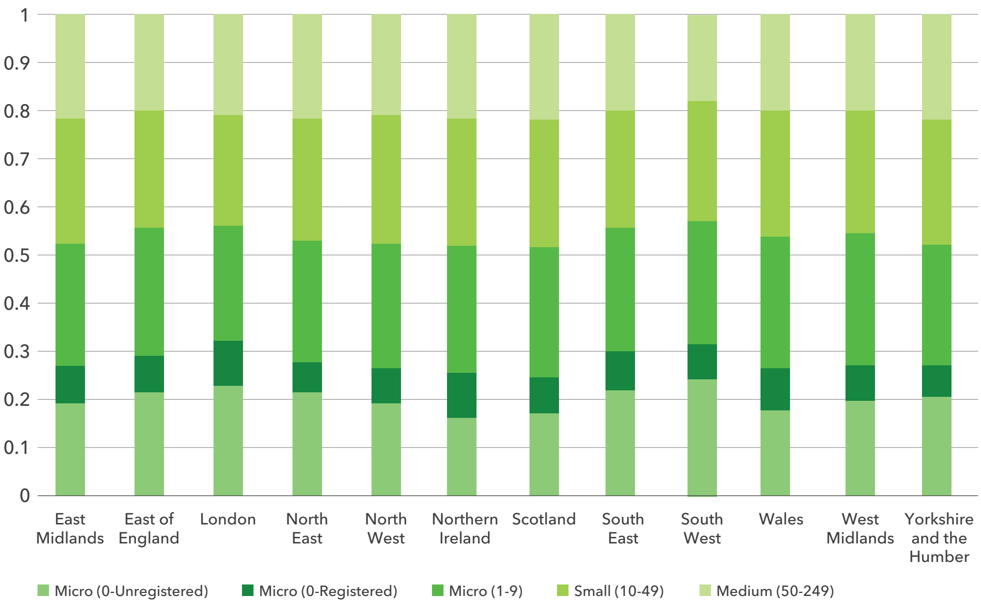
8.1
There is barely any interaction between region and size of SMEs. Figures 16, 17 and 18 show that, in all regions: micro businesses with zero employees contribute a very high proportion of SMEs; SME employment is fairly equally split across each firm size; and zero employee firms contribute the lowest amount to turnover, whilst micro (1-9), small and medium businesses each contribute fairly similar proportions of each region’s turnover.

Figure 16: Proportion of regional SME count by SME size



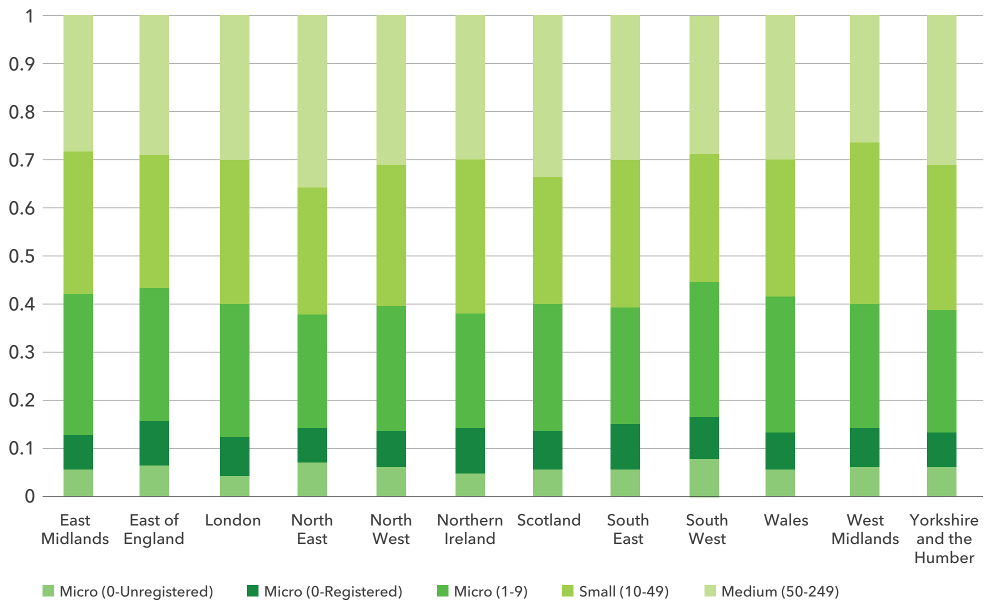
Source: Business Population Estimates, 2018

Figure 17: Proportion of regional SME employment by SME size



Source: Business Population Estimates, 2018

Figure 18: Proportion of regional SME turnover by SME size



Source: Business Population Estimates, 2018

8.2

To further investigate regional variation in turnover per business, Table 10 looks at percentage difference from a national average. It can be seen that in general, firms in London, the South East and the East of England have the highest positive deviation (so are most productive) whilst firms in Wales, Scotland and the South West have the largest negative deviation from the average.

8.3

The table also shows some slight regional interaction with size on productivity. Whilst deviation from the average for unregistered firms is very small for most regions, the productivity of unregistered firms in London is significantly higher than average and that of firms in Wales and the East Midlands is significantly lower than average. Micro (registered) businesses have reasonably small variation around the average except for London and Wales. Micro (1-9) businesses in all regions except London have large negative deviation, however small and medium firms in the South East recover back to above average.

Table 10: Regional variation in percentage difference from national average turnover per business by size of firm

	Micro (0 - Unregistered)	Micro (0 - Registered)	Micro (1-9)	Small (10 - 49)	Medium (50 - 249)
National average turnover per business	£36,000	£139,000	£469,000	£2,800,000	£17,100,000
East Midlands	-11%	-22%	-10%	-20%	-24%
East of England	5%	1%	-8%	-12%	-8%
London	16%	34%	80%	84%	67%
North East	-6%	-13%	-30%	-32%	-13%
North West	-3%	-14%	-19%	-19%	-16%
Northern Ireland	-1%	-7%	-20%	-9%	-16%
Scotland	-4%	-15%	-21%	-35%	-15%
South East	-1%	10%	-10%	8%	5%
South West	-10%	-22%	-24%	-36%	-22%
Wales	-17%	-33%	-27%	-36%	-27%
West Midlands	-2%	-4%	-17%	-3%	-21%
Yorkshire and the Humber	-6%	-20%	-20%	-20%	-2

Source: Business Population Estimates, 2018

SMEs by sector and size

8.4

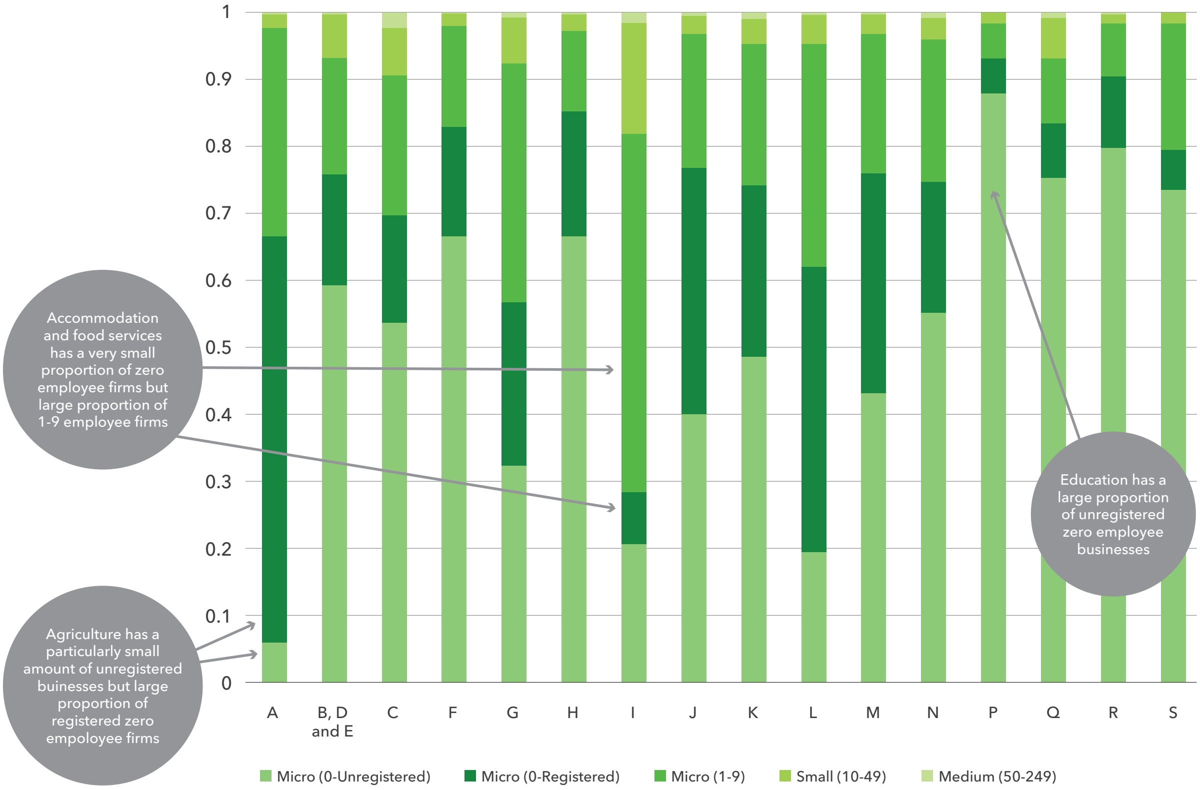
There is much more variation by SME size across sectors than across regions. Figure 19 shows that, whilst micro businesses have a high prevalence in all sectors (over 82% of all SMEs in every sector), zero employee firms are particularly prevalent in the Education sector (93%), which is likely to reflect the many private tutors for academics, music, dance etc in this industry. Zero employee businesses are particularly non-prevalent in the Accommodation and Food Service Activities sector (only 28%), but this sector has by far the largest proportion of 1 to 9 employee businesses (53%) compared to other sectors.

8.5

In terms of employment, Figure 20 shows that Agriculture and Other Services Activities are much more concentrated with micro business (77% and 79% respectively) and Education and the Arts have the highest concentration of zero employee employment (58% and 52% respectively). Manufacturing and Financial Services are much more concentrated with medium sized firms (40% and 31% respectively).

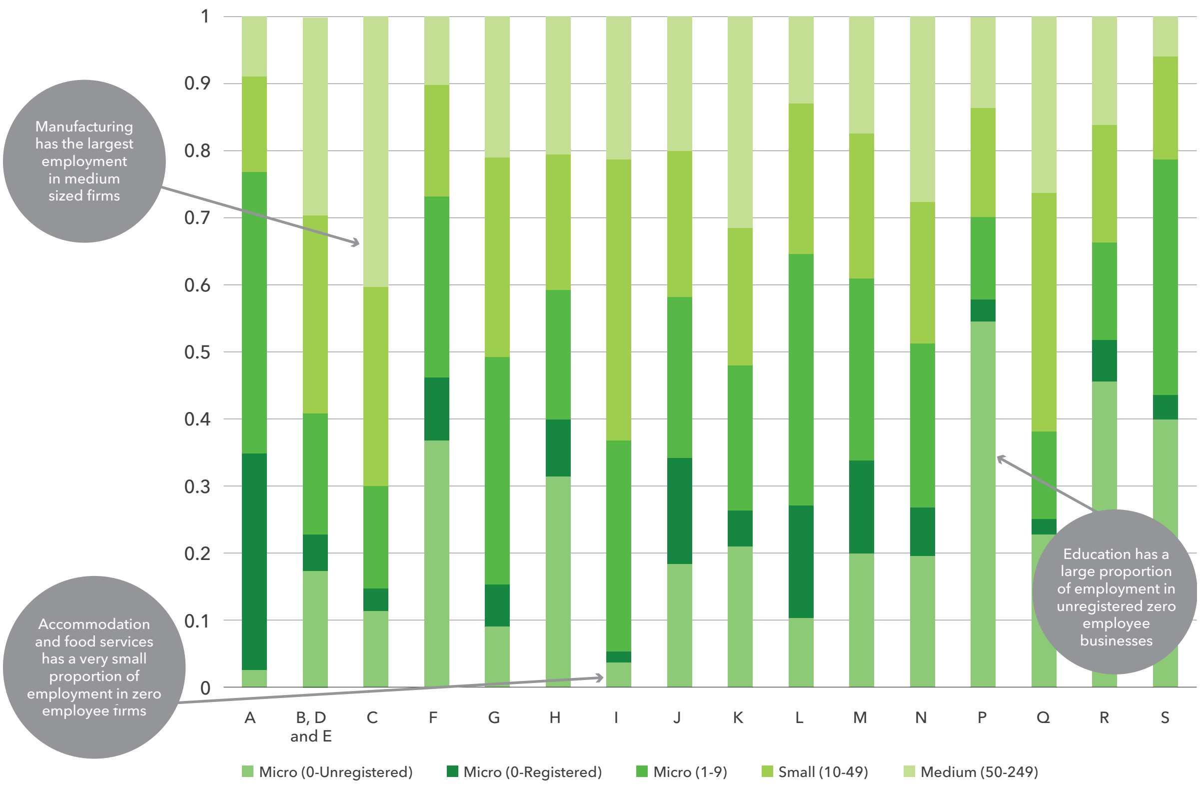
8.6
Figure 21 shows that micro businesses in Agriculture, Forestry and Fishing contribute the largest proportion of their sector's turnover (72%) relative to micro businesses in other sectors. Micro businesses contribute the least in Manufacturing, where medium firms clearly dominate, contributing 53% of total manufacturing SME turnover.

Figure 19: Proportion of Sector SME Count by SME Size



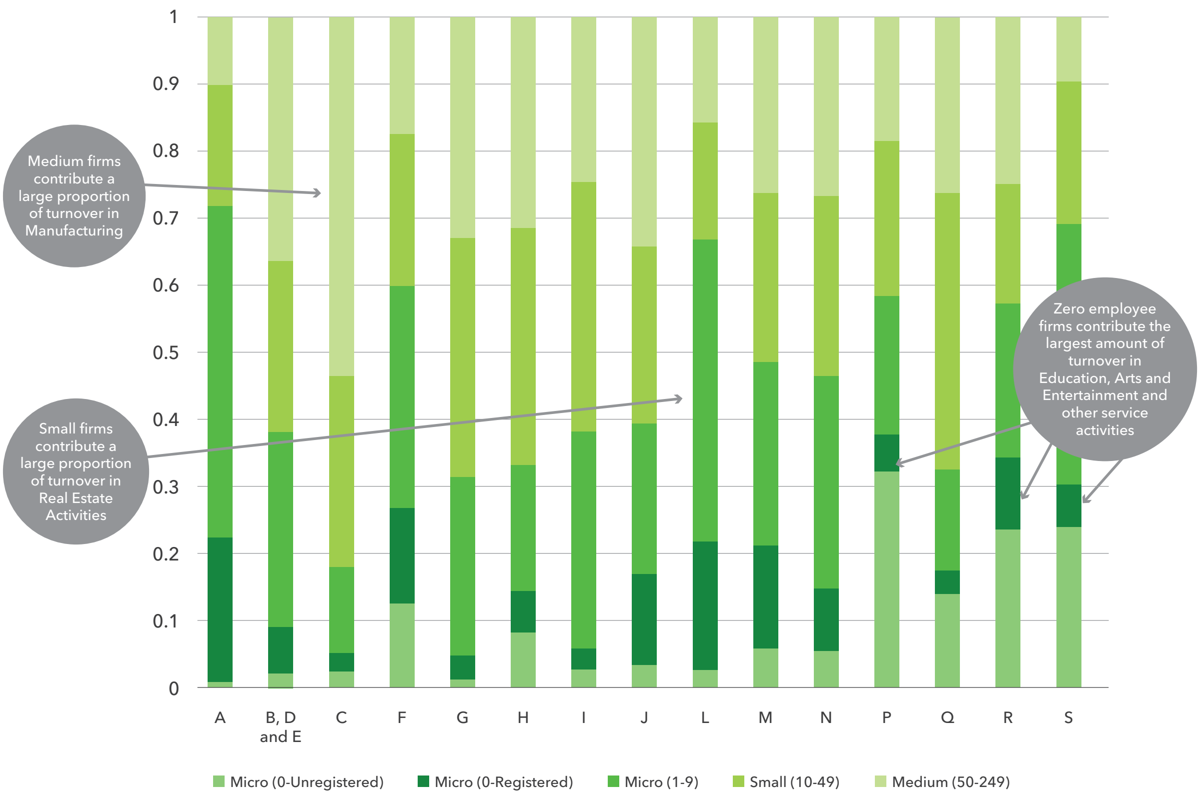
Source: Business Population Estimates, 2018

Figure 20: Proportion of Sector Employment by SME Size



Source: Business Population Estimates, 2018

Figure 21: Proportion of Sector Turnover by SME Size



Source: Business Population Estimates, 2018

Table 11: Industry code reference table

Industry code	Sector
A	Agriculture, Forestry and Fishing
B,D,E	Mining and Quarrying; Electricity, Gas and Air Conditioning Supply; Water Supply; Sewerage, Waste Management and Remediation Activities
C	Manufacturing
F	Construction
G	Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles
H	Transportation and Storage
I	Accommodation and Food Service Activities
J	Information and Communication
K	Financial and Insurance Activities
L	Real Estate Activities
M	Professional, Scientific and Technical Activities
N	Administrative and Support Service Activities
P	Education
Q	Human Health and Social Work Activities
R	Arts, Entertainment and Recreation
S	Other Service Activities

8.7
To further investigate regional variation in turnover per business, Table 12 shows the sectoral deviation from the average. The BDE, Wholesale and Retail, and Construction sectors have generally higher turnover per business than the average, and the Accommodation and Food services, Education and Human Health sectors appear to be particularly below average turnover per business

8.8
The variation in sectoral productivity interacts with size in a number of cases. The Accommodation and food, Education, Human Health, Arts and Other service sectors appear to have particularly lower than average productivity in Micro (1-9), Small and Medium businesses. However Micro (0 registered) firms are the least productive for Manufacturing and Transport and Storage. Larger businesses are more productive in BDE, Wholesale and Retail and IT sectors, whereas zero employee businesses are more productive in Real Estate, Accommodation and Food service and Construction.

Table 12: Sectoral variation in percentage difference from sectoral average turnover per business by size of firm

	Micro (0 - Unregistered)	Micro (0 - Registered)	Micro (1-9)	Small (10 - 49)	Medium (50 -249)
Sectoral average (not including B,D,E or G) turnover per business	£36,000	£139,000	£469,000	£2,800,000	£17,100,000
A – Agriculture, Forestry and Fishing	-3%	-66%	-23%	-36%	-92%
B, D and E – Mining and Quarrying; Electricity, Gas, Steam and Air Conditioning Supply; Water Supply; Sewerage, Waste Management and Remediation Activities	18%	70%	75%	45%	52%
C – Manufacturing	-12%	-36%	-18%	-16%	-7%
F – Construction	21%	34%	8%	13%	13%
G – Wholesale and Retail Trade; Repair of Motor Vehicles and Motorcycles	29%	20%	46%	55%	59%
H – Transportation and Storage	-4%	-53%	-10%	33%	6%
I – Accommodation and Food Service Activities	20%	-30%	-159%	-322%	-307%
J – Information and Communication	-27%	-21%	-31%	14%	20%
L – Real Estate Activities	30%	28%	16%	-71%	-10%
M – Professional, Scientific and Technical Activities	5%	-15%	-37%	-13%	-9%
N – Administrative and Support Service Activities	-9%	17%	4%	-6%	-55%
P – Education	-47%	-81%	-81%	-168%	-223%
Q – Human Health and Social Work Activities	-24%	-91%	-100%	-149%	-317%
R – Arts, Entertainment and Recreation	-11%	-30%	-46%	-137%	-94%
S – Other Service Activities	-28%	-66%	-164%	-175%	-154%

Source: Business Population Estimates, 2018

SMEs by Region and Sector

8.9

Given that there is little regional variation over count and employment outcomes, the following cross analysis only considers turnover by region and sector as this is the only outcome on which there might have been a notable interaction between the two variables.

8.10

However, there was a lot of data deemed 'disclosive'[47] and so the analysis undertaken is only partial. Table 13 presents cases where data for all SMEs (of all employment size bands) was available. Asterisks indicate that at least one employment size band had disclosive data. In such instances, the whole case was excluded so as not to distort the overall results.

8.11

Whilst the large amount of missing data prevents us from drawing inferences on proportional contributions from each combination, we can observe some notable comparisons from the data available. Firstly, Wholesale and Retail (Sector G) is the sector with the highest turnover for all regions, and by quite a considerable margin.

8.12

Secondly, SME turnover in London for the Wholesale and Trade sector (£241,700) is 2.6 times the size of that in the next highest region, the South East (£91,600). It is a similar story for Professional, Scientific and Technical Activities where turnover in London (£80,300) is 2.6 times higher than the South East (£30,800) and in Administrative and Support Service Activities where turnover in London (£54,900) is 2.2 times higher than in the South East (£25,200). The opposite is true in Manufacturing, where turnover is highest in the South East (£24,800) and the North West (£23,800) and these are nearly double that of London (£12,500).

Table 13: SME turnover across region and sector

Sector	South West	East of England	South East	Northern Ireland	North East	West Midlands	North West	Wales	Yorkshire and the Humber	Scotland	East Midlands	London
A	*	*	*	*	*	*	*	*	*	*	*	*
B, D & E	*	*	*	*	*	*	*	*	*	*	*	*
C	13,600	18,100	24,800	6,400	7,100	21,800	23,800	9,100	19,200	13,300	18,100	12,500
F	17,800	30,200	40,700	*	6,100	17,900	*	*	16,200	4,200	14,600	45,300
G	33,900	52,700	91,600	*	*	47,000	50,900	*	35,200	26,600	37,000	241,700
H	4,200	9,500	20,000	*	*	5,500	7,800	*	5,500	*	*	22,500
I	5,900	4,000	6,600	*	*	*	5,400	*	3,700	4,800	*	13,700
J	*	8,300	23,600	*	*	*	5,600	*	*	*	*	55,000
K	*	*	*	*	*	*	*	*	*	*	*	*
L	*	*	*	*	*	*	*	*	*	*	*	22,500
M	16,800	17,100	30,800	*	*	11,500	18,800	*	*	12,100	*	80,300
N	8,600	15,500	25,200	1,600	2,900	13,100	14,800	3,400	9,700	7,800	7,700	54,900
P	*	*	*	*	*	*	*	*	*	*	*	*
Q	5,600	5,400	8,700	1,200	*	*	6,300	*	4,200	*	3,900 9,000	
R	*	*	4,000	*	*	*	*	*	*	*	*	12,300
S	2,600	*	*	*	*	*	*	*	*	*	*	

Source: Business Population Estimates, 2018

8.13

The manufacturing (C) turnover in London seems particularly low. Analysis by Cities of Making[48] highlights that this is mainly due to high rental rates for space relative to other parts of UK (given high demand for housing in London making space competition fierce). If there are manufacturing sectors in the UK, they are more likely small products which don't require too much space as opposed to, say, steelworks or aeroplanes which would also contribute to turnover being small.

A further reason may be the large growth of the services sector / knowledge economy in London, meaning that workers with those services skills are attracted to London, whilst workers with manufacturing skills are attracted to more northern areas of the UK where there are more manufacturing jobs. Finally, the manufacturing share of employment is higher in London than the UK average for micro (0-9) firms and medium firms, but not for sizes in between. This means that micro manufacturing firms would have a harder time scaling up, keeping them at lower turnover levels.

Appendix B: Total business count methodology

8.14
It is assumed that all Companies which exist are registered, hence an estimate of unregistered Companies is not required. All estimates refer to zero employee businesses (either Sole Proprietors or Partnerships) which are not registered.

8.15
Estimates take the number of self-employed people in the UK from the Labour Force Survey and subtract the number of self-employed people already accounted for in registered businesses. The residual is the number of self-employed people in unregistered businesses, either Sole Proprietors or Partnerships.

8.16
Using HMRC tax income data, two things are estimated:

- the proportion of Sole Proprietorships versus Partnerships in the economy
- the average number of people employed in a Partnership

8.17
These estimates are used to transform the number of self-employed people in unregistered businesses into the number of unregistered businesses, either Sole Proprietors or Partnerships.

Appendix C:
Review of Literature on growth, innovation, productivity and SMEs

Why does growth matter?

8.18
Economies grow. Improvements in living standards for wage earners, for pensioners and for public services depend on growth. The rate of growth varies over time, reflecting a mixture of both long-term productive potential and short-term factors, both positive and negative. There is a large literature in mainstream economics about economic growth. A broad consensus exists about the factors which generate growth in the long-term:

- the size of the potential working population
- the skill level of the population (its human capital)
- the level of productive capital available
- technological change, or innovation as it is also described.

8.19
In reality, the concept of innovation covers a range of factors. One is learning how to produce more of the same kind of output from a given set of inputs, which is an ongoing process throughout the economy. More dynamically, inventions create the possibility of developing entirely new kinds of output, whether goods or services. They also enable new processes which improve the volume or quality of what can be produced. Inventions are necessary for growth, but even more important is the ability of an economy to turn inventions from being ideas which enable the creation of new products, to the actual creation of the products themselves. In economies where resources are already fully exploited (in other words the natural resources and the population are already being incorporated into goods and services) the only potential source of growth is increased productivity.

8.20
There are two generally used measures of productivity: labour productivity and total factor (or multifactor) productivity (TFP or MFP). Labour productivity is a measure of the total gross output (or value added) produced by each worker. Productivity per worker hour is derived by dividing gross output or value added by the total number of hours worked.

8.21
National statistical offices break down the sources of economic growth into the contributions from increases in capital, labour and other identifiable factors. When these factors have all been accounted for, the remainder of economic growth is described as total factor productivity or multi-factor productivity. This is conventionally attributed to technological change, although in reality it includes changes in work organisation and other non-measured inputs (for example improvements in workforce skills that cannot be measured by qualifications).

8.22

There are many practical problems involved in this task. There are challenges in measuring both output and capital. Labour inputs (hours worked) tend to be measured fairly reliably, but capital stock (or more accurately the services deriving from the capital stock) is potentially problematic. It is relatively straightforward to measure investment in new capital equipment (buildings, machines, lorries, tools, locomotives, computers), but the rate at which old equipment is scrapped is less clear. Moreover, the same equipment can be used more or less intensively, delivering different levels of output. In a large factory equipment can be run twenty-four hours a day in a three shift system, or can be run for fifteen to twenty hours using a two-shift system. The same equipment is being used to produce different levels of output under the two variants. But the same is true in less obvious settings. A florist might have a van for deliveries. But it can only have a whole van or no van. So the intensity with which it is used (and therefore contributing to the florist's measured output) might vary over time, with peaks from day to day and month to month, even if the underlying trend is that the business is growing.

8.23

Moreover, even measuring new investment can be problematic when the cost of capital is falling. Unless prices of capital equipment are measured accurately the volume of investment can be underestimated when prices are falling (and/or quality improving) as has been happening most obviously to information and communications technology (ICT) equipment, but also to vehicles and machine tools, over the past thirty years. This means that even in its own terms, growth accounting may not accurately capture the non-labour contributions to growth.

8.24

There are also unresolved issues in measuring output itself, especially in industries where innovation is rapid. National accounts institutions, such as the Office for National Statistics in the UK, typically collect information about output measured in current prices. A key task is to divide this between how much of any increase in output is due to inflation, and how much reflects a genuine increase in the amount which is produced, so-called 'real' output in the jargon of economics. Leading econometricians such as Hausman[49] argue that in industries in which innovation is important, inflation is systematically overestimated, and as a result real growth is underestimated.

8.25

The measurement of output is even more complicated where the product or service is completely new (and even more so where it is intangible, as with video or music streaming). The framework of the national accounts was developed in the 1930s and 1940s, when a much larger part of the economy consisted of the production of manufactured goods, in general using stable, well-established technologies to produce physical goods which could be counted or measured (refrigerators, cars, tons of steel). **The path-breaking nature of innovations in areas like ICT presents much more difficulty in terms of estimating their value to consumers.** All new products, or quality improvements to products, will create a benefit to consumers.

Output is not well measured

8.26
A detailed study by William Nordhaus of the output and price of artificial light, measured in standard units (lumens), suggests that over the two centuries since 1800 the price element has been over-estimated by a factor of at least 10,000. The consequence of this mis-measurement of the unit price is that output has been considerably underestimated. This is just one example of under-measured output.

Nordhaus, W. (1996). Do Real Output and Real Wage Measures Capture Reality? The History of Lighting Suggest Not in Bresnahan, T.F and Gordon, R.J. (eds) The Economics of New Goods. pp 27 – 70. NBER

8.27
Other examples suggested by Nordhaus where the measurement of prices does not take account of growth in the volume or quality of output as a result of innovations include: improved health and wellbeing as part of the output of medication; radio and television programmes; passenger journeys generated by the invention of the steam locomotive and the consumer surplus due to the greater convenience of zip fasteners over buttons.

8.28
The issue of measuring (or more usually failing to measure) changes in the quality of either outputs or inputs, is at the heart of the current debate around the causes of growth, and hence its future potential.

Encouraging growth

8.29
Governments can encourage growth by supporting or facilitating the conditions which are associated with innovation. The essential features of this approach are:

- Encourage investment in research and development
- Invest in human capital. The rate of return from human capital investment (that is improving the skills and wellbeing of the potential working population) can be higher than the rate of return to investment in physical capital
- Encourage investment in both human and physical capital which can generate spill-over effects in other firms and sectors so that the social rate of return from such investments is significantly larger than the private rate of return to whoever does the investing
- Protect property rights and patents and encourage new businesses as a source of innovation in both products and ideas

8.30
The role of institutions in fostering or inhibiting growth is often downplayed within economics. But in terms of long-term growth potential, institutional factors such as the way in which output is organised (particularly related to the skills and vision of entrepreneurs and managers), the morale and motivation of the workforce and the role of government, both in terms of the tax regime, and in terms of regulation of both product and labour markets, are vital.

8.31
Most of the above list of concepts are straightforward, but it is worth expanding the perhaps less familiar concept of spill-overs. Growth accounting does not allow for complementarities or spill-overs.

8.32

If new capital equipment requires a particular set of skills in the workforce who are using the equipment, the returns to both the equipment and the enhanced skill are dependent on each other. Without the worker skills the machine will not deliver. But without the machine the workers' extra skills make no contribution to output. New equipment can facilitate new ways of organising work which is more efficient, but which may be unrelated to the machine itself.

8.33

For instance, by making it feasible to track and forecast shopping patterns through the day, week and month, retailers can match their workers' shift patterns more closely to demand. Workers still do the same job, but their hourly productivity has increased because they have less down time during their working shifts. They do not work directly with the monitoring equipment, but it has enhanced their productivity, unbeknown to them.

8.34

Similarly, growth accounting also fails to capture spill-overs/externalities either between other firms in the same sector (i.e. not the firm doing the investment) or by firms in different sectors. So, for example, if investment in transport firms enables them to accommodate more flexible deliveries, productivity grows in the businesses using the transport (say by holding fewer stocks, thereby releasing both space and labour, or by improving quality of service by offering greater flexibility to customers in terms of delivery times) cannot be attributed to the investment by the transport firms, even though it is the cause. The transport using firm may be paying exactly the same as before for transport services (so the measured volume appears to be unchanged) but the quality of that service has changed in such a way that it changes the way work is organised in the transport using firm.

General purpose technologies

8.35

Spill-overs are important, not only in their own right, but for the role which they play in the concept of a General Purpose Technology (GPT). It is this concept which is a key element of much of the current debate about the long term rate of growth in the Western economies.

8.36

A general purpose technology (GPT) is a technology which becomes pervasive across a wide range of industries in a whole host of applications, contributing to the output of a wide range of goods and services. The essence of GPTs is that they are widely adopted, that they improve over time, and that the price of the technology falls as it becomes more widespread. They tend to lead to innovation in both products and processes across a wide range of industries. Some of these innovations represent marginal improvements to existing products. Others incorporate GPT in entirely new products, both those aimed at consumers and those which are innovative capital goods[50].

8.37
The adoption of GPT across the economy can lead to turbulence as existing products and processes are challenged and established production techniques for both goods and services become obsolete. It is here in particular that the role of institutions in growth is important. In the presence of a disruptive general purpose technology, in essence societies can either embrace or resist change. Institutional structures and regulations will reflect the preference of society. The Luddites of the early 19th century have become a classic example of resistance to pervasive innovation, though in this instance of course they failed. The England of the Industrial Revolution embraced innovation.

8.38
The first GPT of the modern era is widely regarded as being the steam engine. The second was electricity. It is increasingly apparent that information and communications technologies (ICT) are the third wave of GPT. However, it needs to be recognised that there is some challenge to the idea that ICT really is the third GPT. The challenge, led by Robert Gordon argued that the impact of ICT on production and product innovation had worked its way through by 2004 and its sole unexploited use is as a source of entertainment[51]. Gordon argues that over the next two decades the effect of innovation will not offset what he calls the "headwinds" which will tend to reduce growth: an ageing population, declining educational standards, persistent inequality, globalisation, energy/environment, and the overhang of consumer and government debt. Others disagree strongly[52].

8.39
The consensus of opinion is moving away from Gordon. A growing number of ICT technologies are related to reducing or managing energy use. The idea that productivity inevitably declines with age is heavily contested in evidence derived from the workplace[53]. There is also a growing tendency for people in age groups which have traditionally retired (those in their late fifties, sixties and early seventies) to continue in paid work. Gordon also argues that ICT innovation since 2000 has focused on small entertainment devices (essentially smartphones and tablets) and that the contribution of the internet to e-commerce was over by 2005. This ignores the evidence of the growing importance of ICT in healthcare, retailing and business services, particularly giving individual workers (as diverse as van delivery drivers, healthcare professionals and engineers) access to small devices connected to internal company networks. **In its contribution to GDP Gordon viewed ICT purely as substituting for labour, whereas in improving the efficiency of other inputs and the quality of outputs.**

The impact of ICT on productivity and growth

8.40
Ultimately, whether ICT is a GPT is a matter of judgement. The full impact of GPTs takes decades or even centuries to feed through. The steam engine in the late 18th century made possible the creation of the railways in the decades around the middle of the 19th century. And the railways themselves made feasible massive transformations in the economy.

8.41

Regardless, the cultural and creative industries, using a market-based definition, are the fastest growing sector of the developed economies[54]. Massive companies such as Google and Facebook have evolved very rapidly in this sector, and both competition and innovation remain intense. Entertainment consumption is shifting from the purchase of concrete goods (a television, a CD) to the purchase of ephemeral services (Netflix, music streaming).

8.42

According to one key study of the United States from 1973 to 1995 the average annual growth rate of total factor productivity was 0.39 per cent, which became 1.00 per cent for the period 1995-2000 and 1.17 per cent for the period 2000- 2006. The share of this productivity growth attributable to ICT was 25 per cent for the period 1971-1995, 58 per cent for the period 1995-2000 and 40 per cent for the period 2000 to 2005.

Jorgenson, D.W., Ho, M.S., and Stiroh K.J. (2008), A Retrospective Look at the U.S. Productivity Growth Resurgence, Journal of Economic Perspectives, 22(1):3-24

8.43

According to a range of studies, up until 2000 a large part of the growth in US productivity was derived from the ICT producing sector, but after 2000 most of it was derived from other sectors using ICT both to improve their processes and to develop new products and services[55]. Bosworth and Triplett (2007)[56] differ in their timing but also stress the central role of ICT use, particularly in services. They suggest that after 1995, 80 per cent of US productivity growth could be attributed to increased ICT use in services, particularly wholesale, retail, finance and health.

8.44

Colecchia and Schreyer[57] stressed the role of the use of ICT in services as being one of the key explanations for differences in productivity performance across OECD countries. The United States, Australia, Finland and Canada all had higher diffusion rates and higher productivity growth than other countries. **Importantly, they argue that it is the use of ICT in other industries and services, not ICT production, which is the key driver.** Countries do not have to produce ICT equipment. They just have to use it to good effect. Others concur[58].

8.45

The acceleration in productivity (measured per worker or per hour) observed in the United States post-1995 has not happened in the EU[59]. Between 1995 and 2006 US productivity per hour grew by an average of 2.3 per cent a year, while that in the EU grew by only 1.5 per cent. Hours worked grew in the EU over this period relative to the US, so that productivity per worker showed a much smaller difference (2.1 per cent). So a larger part of the observed growth in the EU could be accounted for by increased labour inputs.

8.46

It is argued that the increasing US-EU productivity growth gap after 1995 is due to the role of ICT. This hypothesis argues that the EU has not benefited from the higher rates of aggregate TFP growth and ICT capital deepening that have been observed in the US[60]. In particular, van Ark et al argue that the EU has seen much lower levels of ICT investment in services. Trying to isolate the contribution of ICT to labour productivity growth in the EU and the US, van Ark et al. find that it went from 1.3 per cent for 1980-1995 to 0.8 per cent for 1995-2004 for the EU. For the U.S. it went from 1 per cent from 1980-1995 and 2.2 per cent from 1995-2004. Taking a cross-EU view across different sectors van Ark et al show that the key service sectors responsible for the EU-US labour productivity gap are precisely those which have been identified in the US as deriving large productivity gains from ICT use: retail and wholesale trade and financial and business services.

8.47

It is not just at a whole economy level that ICT leads to productivity improvements. Evidence in favour of the hypothesis that firms that use ICT more intensively also tend to innovate more can be found in Spieza (2011)[61], where, linking firm-level data from the ICT Business Survey to firm-level data from the Innovation Survey for 8 OECD countries, it is shown that firms that use ICT more intensively are more likely to obtain new-to-the-firm (but not new-to-the-market) product innovations, organisational and marketing innovations, both in manufacturing and services. Brynjolfsson and Hitt (2003) also found firm-level effects and Bloom et al (2012) argued that US firms were more adept than those in Europe at implementing organisational changes that maximised the impact of ICT on productivity[62]. Other evidence from a number of different countries concurs[63]. **Among the firm-level studies is one from Italy which suggests that every €1 spent on ICT investment generates a return of €45[64].**

8.48
Others have tried to identify spill-over effects beyond the impact on individual firms. Using micro-data Brynjolfsson and Hitt, (1995) and Bloom et al., (2010) suggest that ICT capital tends to exhibit excess returns[65]. Part of this is due to spill-over effects, where other sectors benefit from ICT investments or from complementarity, where changes in workforce skills and in the organisation the production of goods and services mean that sum is greater than the parts. It can also be due to errors in measuring inputs correlated with ICT. As Brynjolfsson and Hitt, (2014) argue[66]: *"The best way to use new technologies is usually not to make a literal substitution of a machine for each human worker, but to restructure the process. … Compared to simply automating existing tasks, this kind of organisational convention requires more creativity on the part of entrepreneurs, managers and workers. … But once the changes are in place they generate the lion's share of productivity improvements."*

8.49

In the light of these general findings that it is ICT use, not ICT production per se that generates productivity growth, other studies have focused on narrower aspects of ICT use. Koutroumpis (2009) using data for 22 OECD countries from 2002 to 2007 (i.e. covering the period when Gordon argues that the impact of ICT had run its course) estimated the impact of a single aspect of ICT – broadband penetration – on GDP. Overall this study found that GDP increases by 0.25 percentage points for every 10 percentage point increase in penetration. Crucially this study found that there are threshold effects. Once broadband penetration reaches 30 per cent of the population its impact on GDP doubles. The author attributes this to network effects: a critical mass has to be reached before the technology can be fully exploited.

Koutroumpis, p. (2009) 'The Economic Impact of Broadband on Growth: A Simultaneous Approach', Telecommunications Policy, 33: 471-485, 2009.

8.50

This makes sense. If businesses make productivity gains from using broadband to interact with (and find) suppliers and customers, the productivity gains will only be realised if suppliers and customers are also broadband users. At the time of that study the technology generally available was basic broadband using copper wires. The incremental effect of significantly faster fibre broadband is only realised when firms have the knowledge and tools to exploit it. Speed alone does not change things fundamentally[67].

8.51

A more recent study of UK businesses found that the use of online analytical services increases productivity by on average 8 per cent compared with firms that do not use such services[68]. A study of 18,000 US manufacturing businesses found that the introduction of data-driven decision making led to productivity improvements of around 3 per cent (in addition to any productivity improvements from more general ICT adoption)[69].

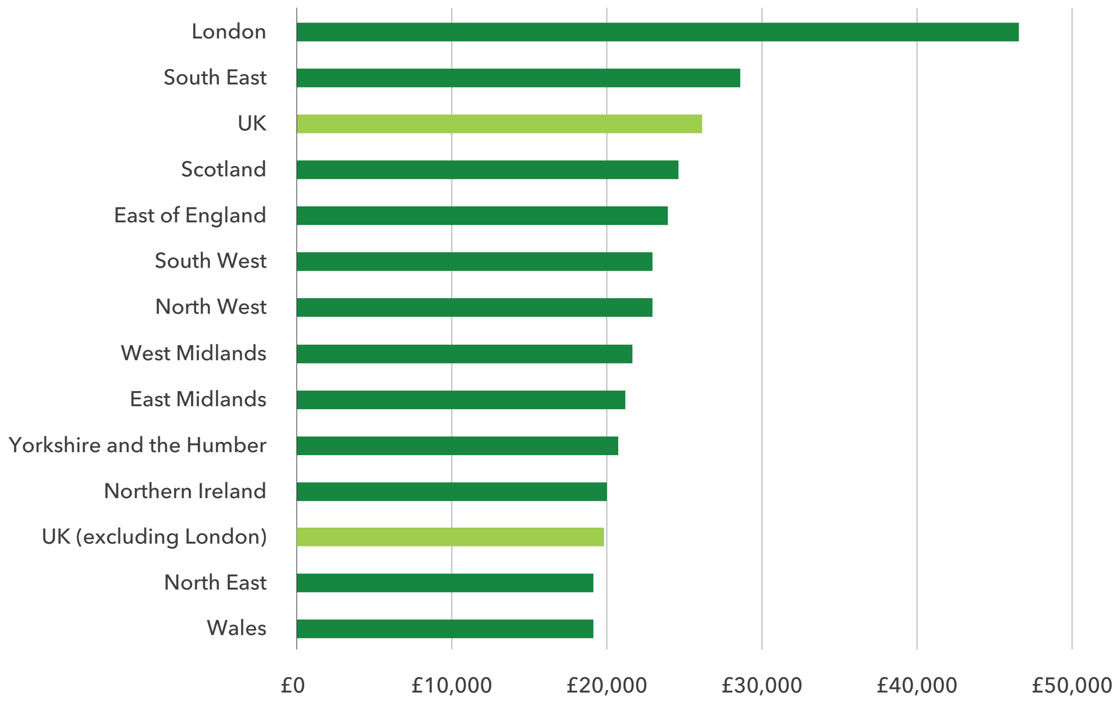
8.52

The gap in productivity between the top 10 per cent and the bottom 10 per cent of firms is 80 per cent larger in the UK than it is in the US, France and Germany[70]. A much larger proportion of UK businesses fall into the "long tail" of low and slow growing productivity[71].

8.53
There are also large disparities in value added per worker by region of the UK. London and the South East perform well above the overall UK average. However, regions such as the West Midlands, East Midlands, Yorkshire and The Humber, the North East, Northern Ireland and Wales are performing considerably worse[72].

8.54
There is growing evidence that part of the answer to this long tail is that British firms are relatively poorly managed. Evidence derived from the World Management Survey (WMS) suggests that management practices strongly influence productivity at the firm level and at the country level. The measured practices cover four broad dimensions: operations, monitoring, targets, and incentives. Data collected in the survey has indicated that the UK not only has a long tail of poorly managed firms, but UK firms are also on average worse managed than those in the US and Germany. Management practices could account for more than half of the total factor productivity gap between the UK and the US[73].

Figure 25: Gross Value Added (GVA) per worker 2016



8.55

A recent study by Oxford Economics for Virgin Media found that if lower performing firms could shift their digital technology use up to the standard of leading firms, some £92 billion could be added to UK output[74]. More than half (£56 billion) of this potential is from small and medium businesses. Of the thousand firms in their survey, **digital technologies had increased sales by more than 4 per cent and had reduced costs by more than 4 per cent as well.** Among those firms they categorised as digital leaders, the increase in sales and the reduction in costs were around a third greater than the average for all firms.

8.56

There is clear evidence that the full benefits of ICT can only be realised where there is also investment in complementary assets and systems, such as human, organizational and managerial capital[75].

AI and data analytics

8.57

New products and services for consumers based on ICT continue to be developed and to grow in importance. These include robotic lawnmowers and vacuum cleaners, the internet of things and energy control systems. Self-driving cars are being tested on public roads.

8.58

One of the key features of the digital economy is that use of a digital product or service by one user (whether a consumer, business or public agency) does not "use it up" and prevent its use by another user[76]. One person's consumption of The Crown on Netflix does not stop anybody else from downloading it and viewing it, whereas the number of seats in a cinema is limited, and one person occupying a seat might prevent somebody else from doing so for a popular film. The accessing of information about potential suppliers by one business does not prevent other businesses from accessing the same information. There might be limits to the capacity of the supplier to meet new business demands, but that reflects physical capacity constraints, not constraints on the availability and use of the information itself.

8.59

But businesses and workplaces are also adopting ICT approaches and devices that may originally have been developed for other purposes. The rapidly falling price of data storage has meant that in fields such as medicine and law it is possible for practitioners to use handheld devices in real time to undertake diagnostics or search for precedents.

8.60

Artificial intelligence (AI) is the use of computers to recognise patterns and communication systems. Humans have the ability to spot patterns, recognise faces and understand different languages. But given the vast volume of data now available and the explosion in computing power, machines can process data and spot patterns much faster and more consistently than humans can. Self-driving cars have to combine GPS information about where they are on the planet, with mapping information telling them where roads are, with traffic lights, speed limits and one-way streets included, then on top of this they need to take account of the weather and the (sometimes unpredictable) behaviour of other road users.

Most "free to the user" internet businesses are powered by artificial intelligence deciding what to advertise to individual users.

8.61

In medicine for some kinds of cancers and other disorders, notably eye diseases, computers are already better than humans at interpreting scans. The computer can also add a checklist of additional potential related symptoms to the human reading the output to help build human skills.

8.62

At present the adoption of these most advanced technologies by business is limited. According to a report by the World Economic Forum and Accenture[77] the productivity impact of robotics, AI and big data analytics is currently being derived from the leading 20 per cent of firms within each industry. These are mainly large firms. The greatest returns are derived from cognitive technologies – AI and big data analytics - rather than robotics. (Perhaps because the use of robots in many applications is already a mature technology. The first robots were used by General Motors in 1961[78].) **For every dollar invested in cognitive technologies output per worker increases by $1.90.** But even for robotics output per worker increases by $1.10.

8.63

Two recent pieces of research reported in the *Harvard Business Review* focus on the implementation of advanced ICT technologies in non-technology companies across the world. The first by Satya Ramswamy[79] found that **the most common use of AI and data analytics was in back office functions, particularly IT and finance and accounting where the processes were already at least partly automated. The new systems led to improved intruder detection in IT systems and better reconciliation, and reduction in fraud and bad debt in accounting systems.** The other striking example cited was for Associated Press. In 2013 the company had been confronted by excess demand for reports of individual company quarterly results and staff reporters were only able to produce enough reports to meet the demand. AP began working with an AI firm to train software to automatically write short earnings news stories. By 2015, AP's AI system was writing twelve times the number of quarterly earnings written by its business reporters.

8.64

Ramswamy found very few examples of the successful use of AI to replace as opposed to supplement the work of human employees, particularly in terms of interaction with customers. As he reminded the reader: ***"Computers today are far better at managing other computers and, in general, inanimate objects or digital information than they are at managing human interactions."***

8.65

The other *Harvard Business Review* study by Thomas H. Davenport and Rajeev Ronanki looked at the adoption of AI in 152 companies[80]. Around half the projects involved the advanced automation of tasks that were already at least partly automated. This included extracting information from emails to update customer contact information or changes to orders, and reading contracts or other email documents to extract key provisions using natural language processing. These robotic processing automation projects are usually the least expensive to implement and can yield high returns (as the World Economic Forum report discussed above also found). Out of the 71 projects of this kind only a handful led to reductions in staffing.

8.66
The next group of 57 projects studied used machine learning and data analytics to perform tasks such as:

- Predicting what a particular customer is likely to buy
- Identifying credit fraud in real time
- Detecting insurance claims fraud
- Analysis of repairs or returns under warranty to identify safety or quality problems in manufactured products
- Providing insurers with more-accurate and detailed actuarial modelling

8.67
Three examples of such projects were:

- A large bank extracting data on terms from supplier contracts and matching it with invoice numbers, identifying tens of millions of dollars in products and services not supplied
- Deloitte's audit practice using cognitive insight to extract terms from contracts, which enables an audit to address a much higher proportion of documents than human auditors would have been able to process
- A US garment company used machine learning for online product recommendations, inventory predictions and just-in-time ordering systems. Buyers, used to ordering product on the basis of their intuition, felt threatened and requested that the program be killed. The buyers had to learn to take on more high-value work that humans can still do better than machines, such as understanding younger customers' desires

8.68
The study also included a survey of 250 senior managers familiar with AI. Only one in five were expecting to use AI to reduce their headcount. The most common reason for adoption (half of those surveyed) was to improve existing products and services. The main barriers to the adoption of AI were reported to be integrating with existing processes and technology (around half of respondents) and a lack of understanding by existing managers (reported by around 37 per cent).

8.69
All the above studies relate to early adopters of advanced ICT systems. So far none of them indicate any large scale job losses. The focus for businesses has been to try and increase or improve output while retaining existing staffing levels. AI has the potential to make working life much better, as Davenport and Ronanki argue: ***"Business drudgery in every industry and function—overseeing routine transactions, repeatedly answering the same questions, and extracting data from endless documents—could become the province of machines, freeing up human workers to be more productive and creative."***

8.70
This is consistent with the findings of Brynjolfsson, Mitchell and Rock (2018) that machine learning is unlikely to replace complete jobs, but that most, if not all jobs as currently configured have some tasks that can be done better by machines, and others that will continue to require delivery by a human[81].

SME productivity

8.71

Across a range of countries the productivity of small and medium enterprises (SMEs) lags that of larger businesses[82]. However, in the UK the difference is larger than it is in most other advanced economies[83]. Moreover, 90 per cent of the firms in the bottom 10 per cent of productivity performance are not just SMEs but micro-firms employing fewer than ten people[84].

8.72

As discussed above, the UK lags behind a range of other countries in management capacity and skills in firms of all sizes, and this has an impact on firms' ability to benefit from the potential of innovations, including ICT. There is strong international evidence that SMEs generally have less well developed management skills and practices than larger firms. These include commercial, project management, financial, strategy and managerial[85]. Good business management skills are essential for SME growth and innovation[86].

8.73

However, there is also strong evidence that UK SMEs have poorer management skills and processes than larger firms[87]. Evidence points to a strong link between better managerial skills and formal management practices including for financial and human resource management. In turn, better management and leadership within SMEs can increase productivity, turnover and employment[88]. This may be because process innovation often involves cost-reduction strategies, whose success depends on the capabilities of managers and entrepreneurs[89].

8.74

Turning specifically to digital skills, two separate recent studies (by BMG Research/ University of Durham and the Federation of Small Businesses) have found that around a quarter of SMEs owners and managers reported that they lacked basic digital skills[90]. However, in many ways this understates the scale of the problem. **The 2017 Lloyds Bank Business Digital Index found that only 59 per cent of small businesses and charities had capability in all five areas of digital basic skills**[91]. These are the key skills for playing an active part in the digital economy and the wider business community. Digital technologies can allow SMEs to improve their relationship with their customers, improve and speed up accounting, resource planning and people management processes, and deliver efficiencies, especially in terms of staff time. However, the introduction of digital technologies needs to be accompanied by staff and management training if it is to have a genuine impact on performance[92].

Table 14: Basic Digital Skills Framework: the five areas of capability

Digital skill	Explanation
Managing information	Find, manage and store digital information and content
Communicating	Communicate, interact, collaborate, share and connect with others
Transacting	Purchase and sell goods and services; organise your finances; register for and use digital government services
Problem solving	Increase independence and confidence by solving problems using digital tools and finding solutions
Creating	Engage with communities and create basic digital content

Source: Lloyds Bank Digital Skills Index 2017

SMEs and ICT adoption

8.75

Small and medium firms cover a variety of businesses and sectors. They do not all need to use ICT to the same extent. The first ICT tool that most firms already have is the telephone (either fixed line or mobile) to communicate with customers and suppliers. The next ICT equipment is usually a personal computer (PC) for word processing and spreadsheets, possibly including accounting and other business practices. The third stage involves access to the internet, which enables email, file sharing, websites, and e-commerce. For many customer-facing service businesses this may be as far as they need to go, although some will benefit from customer relationship management (CRM) software. Small firms in manufacturing may adopt more complex ICT tools such as enterprise resource planning (ERP) software or inventory management software to better manage production and logistics processes. A minority are likely to benefit from using advanced data analytics, machine learning or artificial intelligence[93].

8.76

Consistent with the international evidence related to SME management skills and capabilities, there is evidence that SMEs lag consistently behind larger firms in the adoption of ICT of all types. The main reasons for this are their limited financial, organisational and human capital resources[94].

8.77

Moreover, as with larger firms, discussed above, it can take both time and a reorganisation of processes for the benefits to emerge. Nevertheless, growing firm-level evidence from the UK, Spain, Sweden, Italy and Ireland covering both manufacturing and services finds **a clear relationship for SMEs in line with the general literature on larger firms discussed above, between ICT adoption, change in processes and firm performance.** There is a variety of evidence that the adoption of ICT can provide SMEs with information, knowledge, improved relationships with customers and suppliers. It can help develop collaborative relationships increase efficiency, offer new distribution and communication channels, and reduce the cost of production[95].

8.78

Innovation surveys conducted by the European Commission found that UK SMEs rank 20th out of 36 countries in the adoption of new technology[96]. Even by 2015 40 per cent of companies had fewer than half their employees using computers, and 20 per cent had fewer than one in five[97]. Among UK micro-businesses (those with ten or fewer employees) almost one in four uses no new technology at all[98]. There is, however, some limited evidence that smaller firms are now striving to improve their ICT capabilities[99].

8.79

There is evidence that UK SMEs are beginning to use ICT, at least for standard back office functions. Three-quarters pay taxes online. Four out of five use online banking and nearly four out of five pay bills online.

8.80

A recent study of UK micro-businesses (i.e. those with fewer than ten employees) by the Enterprise Research Centre at Warwick Business School found that web-based accounting software and cloud computing are the most commonly used digital technologies, with more than 40 per cent of firms using these technologies. E-commerce is used by 30 per cent of firms, with 25 and 18 per cent of firms using CAD and CRM respectively. Fewer than one in ten firms use Machine Learning technologies, and only 3 per cent of micro-businesses are using AI[100].

Table 15: Use of digital technology by UK SMEs, 2015 (per cent)

Activity	All SMEs	No employees	1-9 employees	10-49 |employees	50-249 employees
Online banking	82	81	86	89	91
Paying bills online	78	75	85	85	89
Paying taxes online	75	73	82	82	78
BACS payments	71	67	82	84	95

Source: BMG Research and Durham University (2015) Digital Capabilities in SMEs: Evidence Review and Re-survey of 2014 Small Business Survey respondents. BIS Research Paper Number 247. London: Department for Business, Innovation and Skills.

8.81
Around a quarter of micro-businesses use only one digital technology. One in five use two digital technologies, with around a quarter using three or more. However, this is a marked change over the past five years or so. In 2012 web-based accounting software, CAD and E-Commerce were the most commonly used digital technologies, but only approximately one in seven micro-businesses used these technologies. Fewer than one in ten firms were using cloud computing, and other advanced technologies were even rarer.

The impact of ICT on UK SME productivity

8.82
Research in 2017 by Plum Consulting for Sage identified the costs and potential savings from ICT adoption for SMEs in relation to tax compliance and administrative tasks. The study involved 3,000 companies across eleven countries. This found that on average more than 5 per cent of a company's total capacity (120 days a year) is spent on routine administration and compliance tasks. The tasks include accountancy, HR, payroll, taxation, chasing late payments, processing supplier invoices, generating customer invoices and processing payments and recruitment and training. **In the UK the time spent on these tasks represents a potential output cost of around £40 billion a year[101].**

8.83
Each company in the study was asked the extent to which the eight administrative tasks had been digitised in their business (wholly, partly or not at all). This generated a potential score from 0 to 8. In general, as the digitisation score increases administrative costs fall, but the relationship is not marked. When the different tasks are considered separately it is clear that some digitisation generates very little by way of saving. **However, adoption of digital accounting solutions has clear benefits in terms of cost savings. Firms that did not use financial management software had on average costs of accounting around 3.5 per cent of turnover. Those which had adopted a partial digital solution had accounting costs of under 3 per cent of turnover, while those which were using fully digital solutions had accounting costs of around 2.5 per cent of turnover.**

8.84
The study found that in the UK under 20 per cent of firms had fully digitised all eight tasks. Around a quarter had digitised some tasks, and the remainder (just over half) had digitised none of their administrative tasks. Note that this research focused purely on administrative tasks as outlined above. It did not consider the routine use of email, word processing, CRM software, websites or e-commerce. The emphasis was on a company's internal routine tasks. For those in all countries that had not digitised tasks the upfront cost was cited as the most important reason for non-adoption. The UK had the highest proportion of non-adopters (59 per cent) citing this reason.

8.85
In general, SMEs that use ICT improve their productivity as a result of improved efficiency and saving costs. The achievement of lower costs comes about through reduced staffing, improving document handling processes, using financial and accounting applications. E-commerce can also streamline purchasing and sales processes. Other potential benefits include inventory management, logistics, reduced errors and access to global suppliers[102].

8.86
By tracking the adoption of ICT and measuring change in productivity in terms of sales per

employee three years after adoption, the Enterprise Research Centre found that:

- Use of cloud-based computing leads to an increase of 13.5 per cent in sales per employee after three or more years
- Customer Relationship Management (CRM) software use adds 18.4 per cent to sales per employee over three years
- E-commerce adds 7.5 per cent to sales per employee over three years
- Web-based accounting software leads to an increase in sales per employee of 11.8 per cent over three years and,
- Computer aided design leads to a 7.1 per cent increase in sales per employee[103].

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