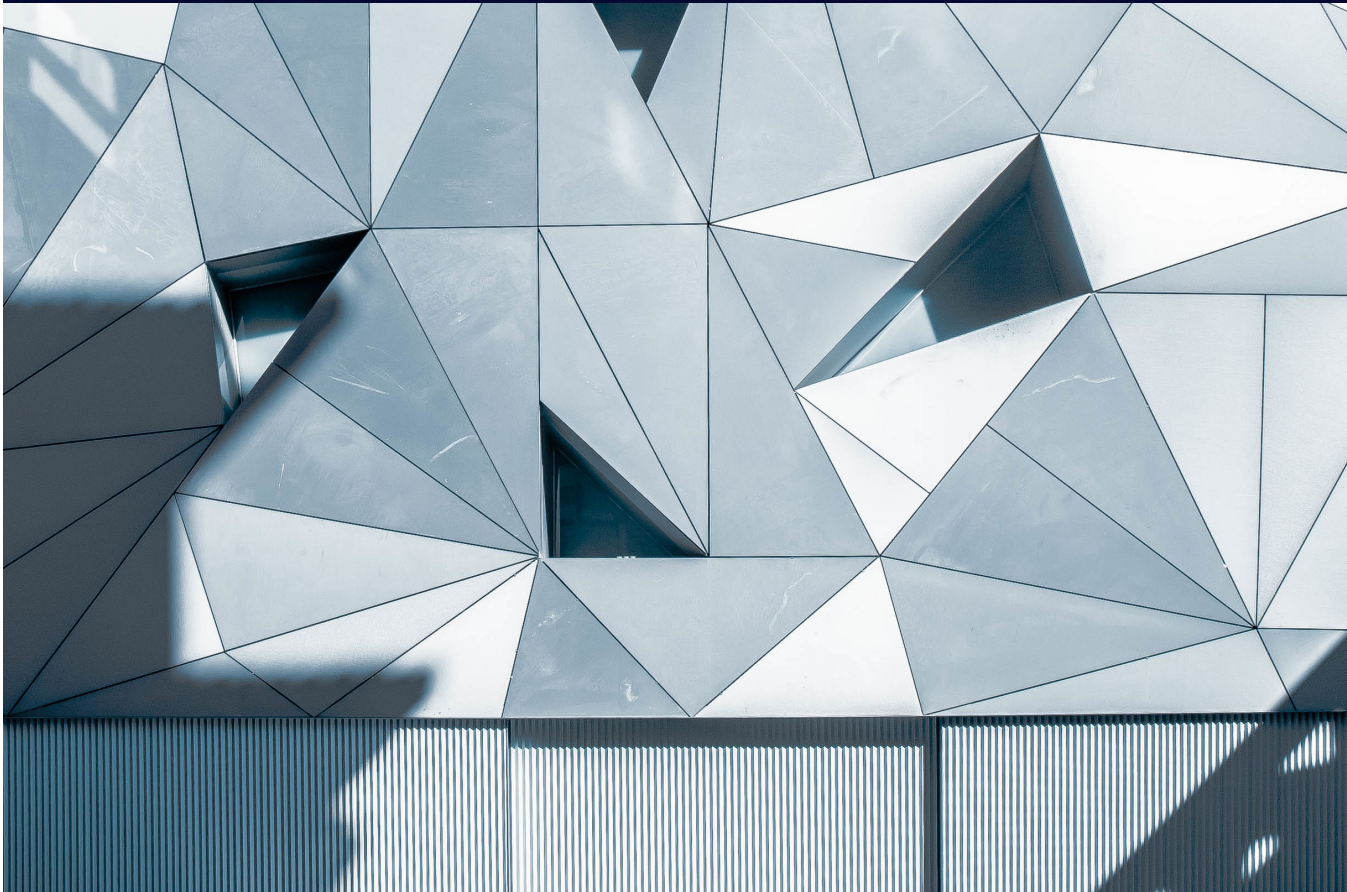


The Coalition for a Digital Economy

A GLOBAL BRITAIN: From local startups to international markets

Tech and digital policy for skills, investment & trade



CROSS-PARTY SUPPORT FOR THE REPORT

“This is a fascinating and timely report from Coadec. It’s extremely important that the voice of startups is heard loud and clear in Government. There are many ideas here; I particularly welcome the focus on digital apprenticeships.”

Baroness Lane-Fox of Soho CBE, Crossbench Peer

“The report offers innovative solutions but does not shy away from the hard truths about Brexit. It is vital the Government properly considers Coadec’s recommendations if we want the next generation of tech businesses to flourish here in the UK.”

Tim Farron MP, Leader of the Liberal Democrats

“This report comes at a pivotal moment as the UK economy prepares for its future outside the EU. Coadec is absolutely right to point to the tech industry as the richest source of new jobs in the UK and an area where we must excel to remain competitive globally. A Government’s role is to foster the changes that bring wealth and prosperity, not to get in their way. That is why the report’s recommendations about cutting red tape, boosting digital apprenticeships and improving access to talent from around the world are so valuable. I applaud Coadec for its contribution to this critical debate.”

Matt Warman MP, former Technology Editor of The Telegraph and member of the Science and Technology Committee

“Coadec is a leading policy voice for tech startups in Parliament. MPs listen to the points made by the organisation, one which is growing in importance for policy makers as Parliament and Government navigate the Brexit process. I therefore welcome this important and timely report and Coadec’s bold, ambitious but achievable measures to help our digital and tech sectors thrive as we exit the EU.

The report sets out important new data that highlights the scale of the challenge ahead - from the need for an effective visa system for tech talent, to improved local access to finance models for startups right across the country.”

Iain Wright MP, Chairman of the Business, Innovation and Skills Select Committee

“Excellent new report filled with bold measures to help our digital and tech sectors thrive, and fantastic to see Coadec go from strength-to-strength. Their policy work has taken on an added importance as we exit the EU and they have my full support.”

Ed Vaizey MP, Former Minister for Digital and Culture

A GLOBAL BRITAIN: From local startups to international markets

Tech and digital policy for skills, investment & trade



February 2017



IN THIS report, Coadec provides new recommendations to Government that will support the growth and scale of digital and tech startups.

To achieve our aims, we travelled the country to meet UK-wide startups; we ran an extensive visa survey with tech founders; we held roundtable discussions with investors, founders and policy experts; and we called on the expertise and guidance of our supporters, from Silicon Valley to Sheffield.

Without their input, this report would not have been possible. So a big thank you to everyone who contributed, and gave up their precious time to offer insight on how the UK tech industry can best navigate its new place in the world. We also thank our report sponsors, Intuit and Orrick, and data partner, Beauhurst. We are extremely grateful for your support.

The volume of feedback and policy challenges means this report is ambitious in its scope. We identify new solutions for the ever-critical issues of skills and talent, extend the investment debate from London to the regions, and begin to address the new international trade relationships after the UK's departure from the EU.

Given the unknowns and scale of the task ahead, this report is by no means exhaustive. It is our initial response to the Government's stated aims for Britain to become the best place in the world to set up and scale a business, a magnet for international talent and the global go-to place for investors and innovators.

But we hope it acts as an introduction to the core themes and ideas Coadec will progress throughout the year. None are straightforward, and many are bold in their ambition. But they reflect the level of change required if we are to build on our strengths and compete on a global scale.

On behalf of our community, we hope this contribution encourages debate about the challenges and opportunities ahead. There has never been a more important time for startup founders to have their voice heard in Government.

Now is the time to make a success of Britain's future.

Thank you,

Romilly Dennys and Alex Depledge MBE
Executive Director and Chair, The Coalition for a Digital Economy

About Coadec

The Coalition for a Digital Economy (Coadec) provides Government relations and policy support to a UK-wide coalition of tech and digital startups, representing their concerns direct to Government. We campaign for the UK to be the world-leading digital economy and the best place in the world to start up and scale a digital tech business. Our supporters include founders, developers, venture capital firms and angel investors, technology companies and accelerators.

We are kindly sponsored by Google, Intuit, TechHub and iHorizon.

Report authors

Romilly Dennys, Executive Director of Coadec and former Government adviser

Ben Fox, Consultant for Sovereign Strategy

Lauren McEvatt, Managing Director, Morpeth Consulting and former Government adviser

Rachel Wolf, Managing Director, Public First and former Government adviser to the Prime Minister

Report sponsors:



Data partner:

Beauhurst

To find out more about our work and join our nationwide coalition, please visit:

www.coadec.com

Twitter: @Coadec

Headline recommendations

SKILLS

1. To drive a large-scale expansion in software development apprenticeships. Many current funded university routes have poor employment outcomes, while courses that are highly successful in the market cannot attract Government funding. This is a clear distortion of employer and consumer preferences, and the apprenticeship system could be used to change this.
2. To move to a system where all 16-19 year-olds are expected to study mathematics, usually to a level above GCSE, as is the norm in many other countries.
3. To make basic levels of literacy and numeracy (GCSE level) a requirement for all further and higher education.

TALENT

1. To allow the high skilled into the country through a minimum six-month visa to enter the UK and seek work for those who:
 - Studied at particular top institutions, or
 - Pass a standardised, high-level exam in specific programming languages

This system would not replace the current Tier 2 visa process, but exist alongside it.

2. To radically reduce the burden for startups by allowing other organisations – such as venture capital funds, or large tech companies – to act on their behalf as Tier 2 sponsors.

INVESTMENT

1. To seek continued collaboration with the European Investment Fund (EIF), as exists for other non-EU countries (e.g., Israel) but simultaneously amplify the commercial arm of the British Business Bank.
2. To replace the European Regional Development Fund (ERDF), but extend to include local private-led investor funds for startups and scale-ups, with reduced regulatory controls. This should be supported by new forms of tax relief for corporates looking to bring jobs and startup support to regional cities.
3. To incentivise pension funds. In particular, local Government pension funds should invest long-term in scale-ups.
4. To apply a 'scale-up' tech test to all funds and incentive schemes to ensure that relatively small but growing companies can easily access capital.

TRADE

1. To secure an adequacy decision from the European Commission to enable EU personal data to be processed by startups in the UK, without them incurring expensive legal costs.
2. To engage early on matters relating to data movement and tariffs, to ensure there is neither a gap in the trade relationship with the EU, nor a negative impact on the UK's ability to negotiate internationally on matters relating to trade, once the future relationship with the EU is secured.
3. To work constructively with the new US administration to ensure progress made on binary versus non binary language in trade agreements is not lost in any future bilateral US/UK trade deal.
4. To increase industry understanding of WTO negotiating practices and avenues for dispute resolution, to create an early warning system.

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Introduction:
The UK Digital
Tech Industry

A GLOBAL FORCE

The United Kingdom is emerging as a global force in digital technology.

- The digital tech sector is creating jobs materially faster than other industries and driving employment.¹
- Google, AWS, Apple, Snap, Facebook and IBM have all unveiled plans to expand, invest and create jobs in the UK.
- Investors backed 4,009 deals in the UK technology industry in 2016, up from 2,858 the previous year – drawing more investment than any other European country.²
- More than £6.7 billion was invested in UK tech firms in 2016, with a sharp rise in merger and acquisition activity during 2016.³
- The UK continues to be the No.1 destination for international tech talent from inside and outside Europe [ibid].

A few examples:

Will Shu, Deliveroo:	United States	>	London
Taavet Hinrikus:	Transferwise: Estonia	>	London
Jose Neves:	Farfetch: Portugal	>	London
Riccardo Zacconi:	King: Italy	>	London
Jesper Buch:	Just Eat: Denmark	>	London

- The UK also boasts strong regional ecosystems, including Cambridge, Oxford and Manchester, which are advancing world-class research and digital innovation.

But now is not a time for complacency, as we set out in this report.

The UK is going through a period of enormous change. As we leave the EU, the Government must strike new deals with the rest of the world while also dealing with the social and economic divisions in our country.

This will lead to dramatic shifts in our economy. If we get the next few years wrong, the UK could end up poorer and more divided. But there is also the opportunity to become a more innovative and entrepreneurial country – one whose citizens see the benefit of ensuing prosperity.

1 Atomico, The State of European Tech 2016, www.atomico.com

2 GP Bullhound/Telegraph 2017, <http://www.telegraph.co.uk/technology/2017/01/07>

3 London and Partners 2017, <http://www.londonandpartners.com/media-centre>



Chapter I:
Investing in
Our Future

SKILLS

I. Introduction and Headline Recommendations

The tech sector relies heavily on a foreign workforce, because we do not have enough high-skilled people in this country. The industries the Government has identified as potentially high-growth are particularly reliant on skills in short supply: Artificial Intelligence (AI), data science and robotics are good examples.

In writing this chapter, we investigated which skills are currently in greatest demand by tech startups, and which are most likely to be in high demand in the future.

Using this framework, we identified three major shortages that must improve dramatically if we are to meet the challenges of the next decade:

- Software development (interchangeable with software engineer)
- Advanced science, technology, engineering and mathematics skills (STEM)
- Basic skills in literacy and numeracy

The third area, basic skills, is not usually part of discussions on tech skills, but is utterly critical to the success of businesses – and to the development of more advanced skills.

None of these areas are unknown to Government. There has been a plethora of announcements over the last several decades: from computing curricula in schools, to endless small STEM initiatives, to adult literacy programs. Many of those announcements have made a small, positive difference. Not one has transformed the system.

For that reason, we do not have a long list of minor recommendations, but three large ones:

Recommendations

1. To drive a large-scale expansion in software development apprenticeships. Many current funded university routes have poor employment outcomes, while courses that are highly successful in the market cannot attract Government funding. This is a clear distortion of employer and consumer preferences, and the apprenticeship system could be used to change this.
2. To move to a system where all 16-19 year-olds are expected to study mathematics, usually to a level above GCSE, as is the norm in many other countries.
3. To make basic levels of literacy and numeracy (GCSE level) a requirement for all further and higher education.

It is important to note that these policy recommendations apply for England, as it is beyond the scope of this report to go into a detailed examination of the three other devolved countries' approach to curriculum development, university policies, teacher recruitment and training.

None of these changes are easy, but they are the level of shift required. The rest of this section explains how we came to this conclusion.

II. Digital Skills vs Skills for Current and Future Tech Startups

The computer revolution has spawned countless innovations and, with it, the demand for a wide variety of new specialisms. For this reason it is very difficult to define digital or tech 'skills' - companies' employment needs range from data science specialists with PhDs in physics and computing, to front-end developers, to digital marketing experts. That is leaving aside the way in which tech is infiltrating other disciplines, such as medicine and engineering, or our desire to make public services digital.

It is not surprising, therefore, that the term ‘digital skills’ spans so many categories:

1. The ability to use the most common web applications (online shopping, or pupils who can search Google).
2. The requirements of a substantial proportion of current jobs (for example using Excel spreadsheets and shared online calendars).
3. Cognitive, social, and emotional skills that are desirable to employers, including those in tech.
4. The requirements of the current tech industry – which, as mentioned above, are highly varied.
5. Assumptions about skills needed for the future – for example, when automation is more common, and some current skilled manual jobs are replaced.

This report focuses on the final two of these points.

It is also difficult to define digital, or tech, as precisely as we would wish. There are several frameworks for defining digital skills, and none of them map perfectly to industry¹. The distinction between ‘digital’ and ‘tech’ is also more blurred than frameworks and policy conversations suggest.

Finally, the comprehensiveness of many of these frameworks makes them less useful for the startups Coadec represents, as they try to encompass all digital and tech-related skills for the working population. They also don’t put as much emphasis on the highly specialised skills that are likely to lead to rapid growth for companies, and to radically increased competitiveness in the future. To give an example, the ability to use a Content Management System (CMS) would score very highly on most digital skills frameworks, but would be considered a basic skill by most startups. It would be of little interest to those engaged in new areas of high growth, such as Artificial Intelligence (A.I.).

¹ For a comparison of some of these frameworks, see the Ecorys report for the DCMS, January 2016

III. Our Framework

We have taken an alternative approach: surveying skills that are a) In high-demand, b) Particularly needed in the early and high-growth stages of startups and in areas of potential high growth², 3) Require a high-functioning, formal education system (i.e. they cannot be learned on the job). The skills that met these criteria are below.

Category	Type	Description
Specialist skills needed by a high proportion of startups	Software development	<p>This usually means knowledge of more than one language and thousands of hours of practice, at least in the initial languages learned.</p> <p>A computer science degree: not required to become a developer, but extremely important for many tech start-ups.</p>
Specialist skills in specialist, high-growth companies [science, technology, engineering, mathematics (STEM)]	Highly formal, quantitative training	<p>Mathematics, physics, or a related mathematical subject. Fields requiring these skills include data science and artificial intelligence. We expect these fields to grow rapidly over the next thirty years.</p> <p>Other STEM specialisms – such as neuroscience – are required by companies that work in the host of disciplines at the nexus of biology and tech, which are also high-growth areas for the UK.</p> <p>Engineering: both a continued major area of growth in its own right, and increasingly required in the interface with digital applications (for example, the Internet of Things).</p>
Needed by everyone	Good basic education	This is needed in and of itself (the ability to write fluently and intelligibly is required for most web and mobile applications) and as a prerequisite for other skills in this list.

² For example, those identified by the Department for Business, Innovation and Skills, now Business, Energy & Industrial Strategy, within the Eight Great Technologies that are digital and tech-related. These include big data and energy-efficient computing, robotics and autonomous systems, and synthetic biology.

There are three other categories we have not included:

1. Disciplines that require an understanding of tech, but not a formal background in it – for example, product management and project management. The startups we talked to felt this was less of a hiring constraint.
2. Specialisms required in both tech and other kinds of companies (for example: finance, sales, and operations). These skills are often in short supply, but are not a specific digital or tech issue.
3. Cognitive and emotional skills (called by a host of names from interpersonal skills to professionalism). These skills are incredibly important, but can be learned in myriad ways.

The skills in our framework share one obvious characteristic: they all, in different ways, fall into the science, technology, engineering and maths (STEM) category. The STEM shortage is well-documented, and it is no surprise the tech sector suffers from it too. On the other hand, the way the education system can best teach each of these subjects is radically different – and requires different solutions. In the rest of this report we look at each area in turn, and ask how well we are doing at teaching these skills and how we can improve the situation.

2. Software Development

There is well-documented evidence of the ever-increasing demand for developers, who are already in short-supply.

- A recent report by Ecorys for DCMS³ found serious skills gaps for senior programmers and data scientists.
- The innovation charity Nesta found that two-thirds of companies that rely on heavy use of data experienced difficulties trying to recruit analysts in the last 12 months.
- The ONS and Eurostat found that 39% of digital recruiters – companies recruiting for digital specialist roles in any sector – reported hard-to-fill vacancies. Looking specifically at the digital sector, this rose to 52% of businesses. The most sought-after skills were developers.
- A new report by Balderton Capital⁴, The European Talent Landscape, found that startups need engineering talent at every stage of their growth, and that it took \$5,000, on average, to hire top engineering talent (in addition to salary). This is a very large sum for most startups.
- Senior developers remain on the Government's Shortage Occupation List.

³ <https://www.gov.uk/Government/publications/digital-skills-for-the-uk-economy>

⁴ <https://talent.balderton.com/>

You would expect such high demand to be met with a large increase in the number of people studying to become software developers, but it is not clear that the traditional routes of A-Level and university degrees in computer science are meeting demand. On the other hand, newer routes are becoming increasingly popular and could provide a solution to major skills shortages.

I. The Different Routes to Becoming a Developer

Over the last few years, there has been a proliferation in online coding courses, boot-camp coding courses, and short immersions that promise to teach you how to code in a day. These sit alongside the more traditional computer science courses at university, the transformed school computer curriculum, and digital apprenticeships.

The table to the right gives a brief description of some of these different routes.

II. Do Formal Academic Routes Work?

Degrees

Computer science degrees have a mixed reputation. Of the undergraduates who qualify across all higher education subjects, computer science has had the highest rate of unemployment [11.7% six months after graduation]⁵.

In response, Ministers launched a review by Sir Nigel Shadbolt⁶, focused on Computer Sciences degrees within English higher education institutions (HEIs)⁷.

Some computer science degrees – like the one described above at Imperial – are high quality, highly respected, and lead to solid job prospects for graduates, but this is not consistent across all universities.

Many tech companies and investors we talked to in writing this report consider this to be because the content, teaching and expectations in some computer science degrees map badly to industry needs – from the languages taught to the lack of real, in-context practice.

In addition, numbers are not growing rapidly. On the next page is a chart of the number of undergraduates studying computer science at publicly funded English HEIs⁸.

Although there has been modest growth in the last few years, they are below 2005-06 levels, despite overall growth for the Higher Education sector. Poor employment prospects may be the reason for a lack of student uptake.

⁵ https://www.gov.uk/Government/uploads/system/uploads/attachment_data/file/518575/ind-16-5-shadbolt-review-computer-science-graduate-employability.pdf

⁶ Ibid: Sir Nigel Shadbolt Review 2016

⁷ Ibid: Sir Nigel Shadbolt Review 2016

Traditional Routes

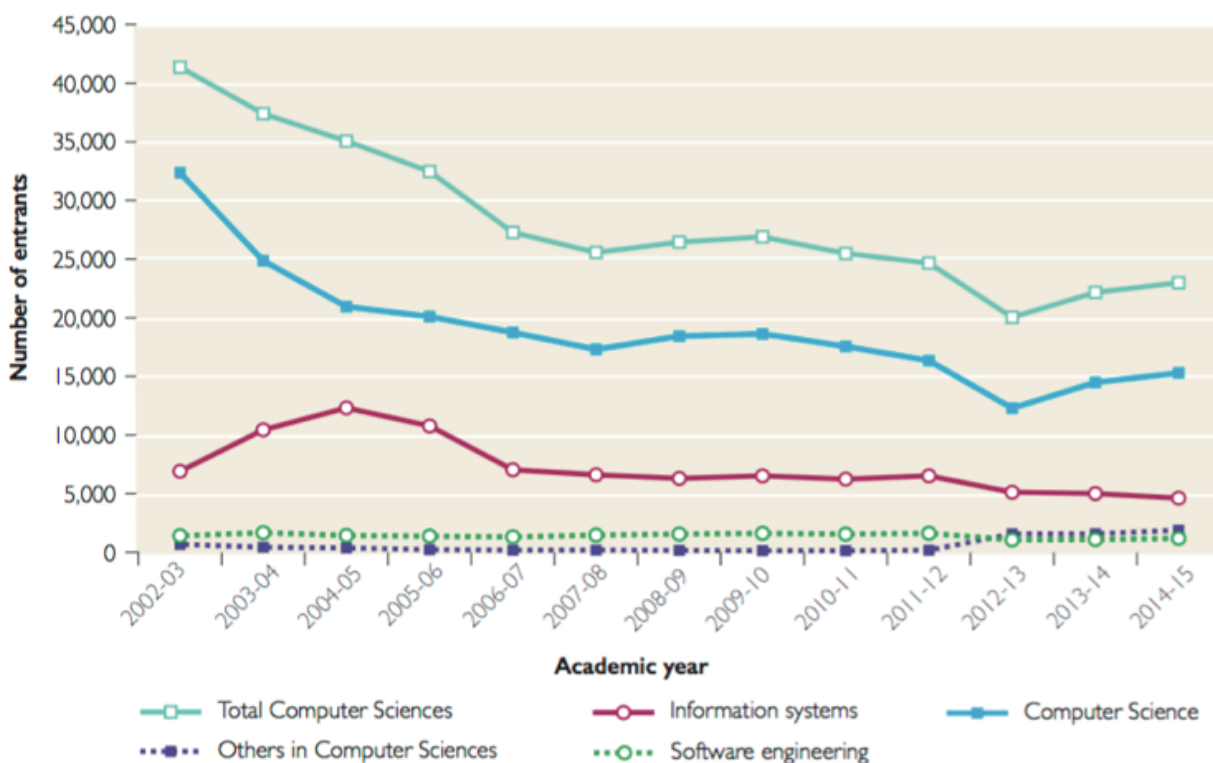
Course type	Length	Cost	Content	Prerequisites
Computer Science A-Level Classroom learning over two years	360 hours of .guided learning'	Schools are funded per student. The average per A-Level student is £1,000 to £2,000	Fundamentals of all aspects of computer science including programming, data structures, computation, and computer systems and architecture	Vary from school to school
Computer science degree at Imperial	Three years	£27,000 (£9,000 per year) plus a similar amount for maintenance (therefore above £50,000 in likely debt)	Very comprehensive: covers coding but also architecture, large amounts of mathematics and artificial intelligence	A levels: Two A-grades and an A*-grade minimum, rising to an A* and three A-grades, with an A* in Maths
Software Development (BSc) at the University of Suffolk	Three years	£27,000 (£9,000 per year) plus a similar amount for maintenance (therefore above £50,000 in likely debt)	The design and development of apps, applications, tools and services for desktop, mobile, tablet and smart devices, plus the Web and Cloud-based systems.	A-Level: BBC

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Newer Routes

Makers Academy	On-site or remote boot-camps designed to get students to junior developer level	12 weeks (around 1,000 hours)	£8,000 in person; £4,000 remotely	A course that trains people to become skilled problem solvers using modern software development practices, working in pairs/teams and writing craft-life software.	None, but specific selection process accepting 1 in 10
Digital apprenticeship	Combination of off-site training (20%) and training and learning on the job	Typically 24 months (around 600 hours)	A maximum Government contribution of £18,000, half-funded by the employer	Fourteen technical competencies including the ability to write code, develop user interfaces, test code, and deploy in enterprise environments	GCSE-level Maths and English required before or by the time of finishing the course
Nanodegree (e.g. Udacity)	Online training	nine to 12 months (or more)	\$150 a month	Series of projects using HTML and the Bootstrap CSS, jQuery's DOM manipulate in 'JavaScript', the Knockout framework, and the Jasmine testing framework	The ability to communicate fluently and professionally in written and spoken English. The ability to independently solve and describe a solution to a maths or programming problem. Familiarity with basic programming concepts such as variables, conditions and loops.

Figure 5 Undergraduate entrants to Computer Sciences at publicly-funded English HEIs, 2002-03 to 2014-15 by sub discipline



Source: HEFCE analysis of the HESA standard registration population, undergraduate entrants to publicly-funded English HEIs, 2002-03 to 2014-15.

Schools

In the meantime, the Government has made a concerted effort to embed computer science in schools. It has introduced a curriculum – including in primary schools – developed with substantial input from experts in the industry. The curriculum has a major focus on programming, as do the GCSE and A-Level computer qualifications. Unlike university curricula, the reputation of the new school content was generally quite high with those we spoke to.

Unfortunately, the uptake at an advanced level is low (though growing). The majority of English schools are not offering computing at GCSE and beyond. A recent report by Roehampton University found that only 28.5% of schools entered pupils for GCSE computing, and only 24% providers entered pupils for A-Level. This masks huge geographical differences. In nine local authorities fewer than 2% of pupils sat GCSE computing, and in seven local authorities not a single student took computing A-Level: City of London, Enfield, Gateshead, Knowsley, Peterborough, Rutland and Salford.

Bottom Local Authorities in Provision of Computing GCSE

Local Authority ⁹	Schools providers %	Students %
Barking and Dagenham	7.7	0.4
North East& Lincolnshire	7.7	0.5
North Tyneside	5.6	0.6
Darlington	9.1	1.4
Peterborough	10.5	1.8
St Helens	7.1	1.8
Blackburn with Darwen	11.8	1.9
Stockport	16.7	2.0

The pattern for traditional, formal routes is therefore disappointing: sluggish growth and take-up, and low employment prospects. This is in contrast to the plethora of private provision that has started to appear.

III. New Routes

In contrast, new providers have experienced rapid growth and demand, and high rates of employment, for computing courses. This is despite the fact that students are usually paying out of their own pocket, often upfront, without any Government support.

Unlike many computer science courses, these new providers are practical, intense, and entirely focused on current labour market demands. Their success depends on their ability to get people employment.

⁹ The Roehampton report included the City of London and the Isles of Scilly. However, these Local Authorities are anomalous in all education statistics because of their very small size and unusual student characteristics.

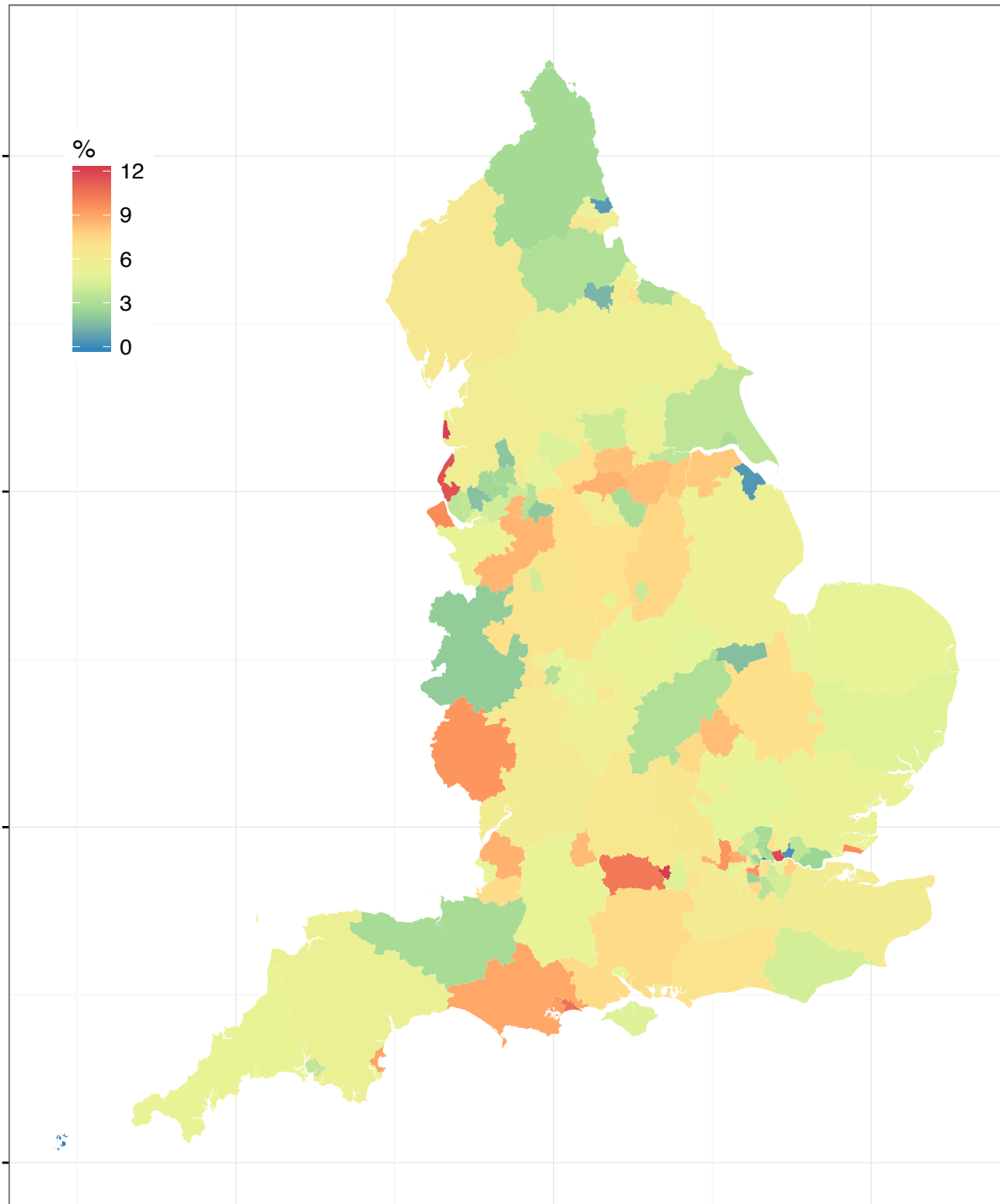


Figure 1: 2015 GCSE computing heat map by % of students per local authority

(Source: The Roehampton Report)

Case Study: Makers' Academy ¹⁰

Makers Academy was founded in 2013 and it will train around 450 new coders this year. By 2018, it is likely to hit 1,000 students, despite intensive selection (only one in ten applicants are accepted). Students pay £8,000 for the training.

If the Government subsidised the course in the same way it funds apprenticeships or computer science courses, Makers Academy estimates the number of successful applicants would increase ten-fold within a year. That is 20% of the computer science undergraduate cohort.

Prospective developers go through an intensive, highly practical 12-week bootcamp, after which they should have the skills to become junior developers. Over 90% of students seeking jobs are successful within a year.

Companies work with Makers Academy because of the enormous shortage of developers – and because those who go through the bootcamp are much more likely to pass companies' technical tests. This is in part because of rapid iteration – new Makers' Academies students arrive every six weeks. The course is tweaked – sometimes substantially – after every intake. This means the course changes up to 20 times in the same period in which a degree course would change once: the result is something much closer to market demand.

The level for Makers' Academy developers is substantially higher than the new standards for degree apprenticeships, and employment rates are much higher than for average university degrees. Both degree apprenticeships and universities attract high Government subsidies.

¹⁰ <http://www.makersacademy.com>

Interestingly the Tech Partnership, which recently created new standards for a degree apprenticeship for programmers, is much closer to the content of these new courses than many traditional computer science degrees. This is a very promising sign, and a reminder that becoming a developer is much better suited to the apprenticeship model than a university one.

Apprenticeships combine training with employment and on-the-job supervision. Apprentices usually exchange lower wages in return for help and training from employers. This is exactly the pattern for Makers' Academy graduates: after intense off-site training, students become junior developers. Junior developers are expected to still need a large amount of support and supervision, and several more years before they become senior developers with concomitant wage increases.

There are three differences between private courses and apprenticeships.

First, in apprenticeships, it is usual for training to happen consistently throughout the year, whereas in Makers' Academy training is intensive and upfront.

Second, Makers' Academy, Udacity and others place students with employers after they have completed their training, not before.

Third, Makers' Academy students neither receive a formal qualification nor map to the fairly rigid accreditation rules of current digital apprenticeships. Instead, employers judge them through comprehensive interview tests – almost always including a practical coding test. Because development is such a rapidly changing field, the tests change frequently too. Alternative qualifications and accreditation are not strongly desired by developers – if they can get jobs in creditable companies, they are happy.

This may be because people training as developers often start more highly educated than the general population: a high proportion of Makers' Academy students are already graduates, so the need for further qualifications is low. But it is also because there are accepted and reliable ways of testing developers' ability. This is unusual for apprenticeships.

The Government has increasingly pursued apprenticeships because it wants to create training that meets market need. There is a major shortage of developers and courses like Makers' Academy are clearly meeting that shortage: both students and companies (who pay a referral fee) are willing to put their hands in their pockets. Yet Makers' Academy does not qualify for Government subsidy, while computer science courses with low employment rates do. This is preventing the scale of skills we need, while excluding poorer students and reserving tech jobs for the fortunate few.

IV. Recommendation

There are two ways in which high quality, high demand courses for developers could be supported by the Government. The first, which would involve comprehensive

change of the adult education system, would be to move to a flexible financial entitlement for individuals that allowed them to access funding for approved courses they chose, regardless of whether these were formal three year degrees, or shorter intensive courses. This has been discussed many times, and would be desirable, but for the specific needs of tech startups is needlessly disruptive.

The second would be to adapt the current apprenticeship model so that courses like Makers' Academy could access funding. Our recommendation is that the Department for Education pursue this option. They should pilot, with the intent of rapidly scaling, a modified degree apprenticeship model focused on developers. The degree apprenticeship should:

- a. Give funding support, including existing graduates, for young people who wish to become developers. This is justified in an environment of very high skill shortages.
- a. Allow existing coding tests as a substitute for other forms of apprenticeship accreditation. The tests would be checked by approved experts.
- b. Ideally, allow prospective developers to complete training before being taken on by an employer. There are precedents for this. Jockeys, for example, attend a 'pre-apprenticeship' training, Government funded, which they must pass before being taken on as a paid rider.

The Government Digital Service has created a good coding test for its recruitment and this should be considered for potential usage more widely.

3. STEM and Quantitative skills

There are a number of characteristics that unite advanced STEM skills in terms of education policy.

Firstly, they are incredibly difficult to learn outside formal education. Secondly, they take a very long time to learn – usually many years of full-time study across school and higher education. This means they are much harder to pick up through part-time, later study than many other subjects. Thirdly, they are cumulative subjects (understanding new concepts depends on having a solid foundation in earlier subjects). Long gaps in learning are therefore very problematic.

Finally, they tend to be in high demand in the labour market, and there are usually signs of skill shortages in this area.

I. How England Treats These Skills

England is internationally poor in its level of mathematical and science training for students over 16. It is even worse for basic Maths skills, as the next section shows. The table below shows the percentage of students who study Advanced Maths after 16. England is at the very low end, while Scotland does much better. This low percentage is a reflection of the general lack of mathematical and scientific training compared to many other countries – both 16-plus and in Higher Education.

Proportion of post-16 students studying Advanced Maths¹¹

High (31-100%)	Japan, Korea, New Zealand, Singapore, Taiwan
Medium (16-30%)	Australia (New South Wales), Estonia, Finland, France, Hong Kong, Scotland, Sweden, USA.
Low (0-15%)	England, Germany, Ireland, Netherlands, Northern Ireland, Russia, Spain

(Source: Nuffield Foundation 2014)

This difference is the biggest factor behind the low pipeline of STEM skills in England, because an unusually high proportion of students drop all quantitative training after the age of 16. Therefore, it is extremely difficult for them to retrain later on.

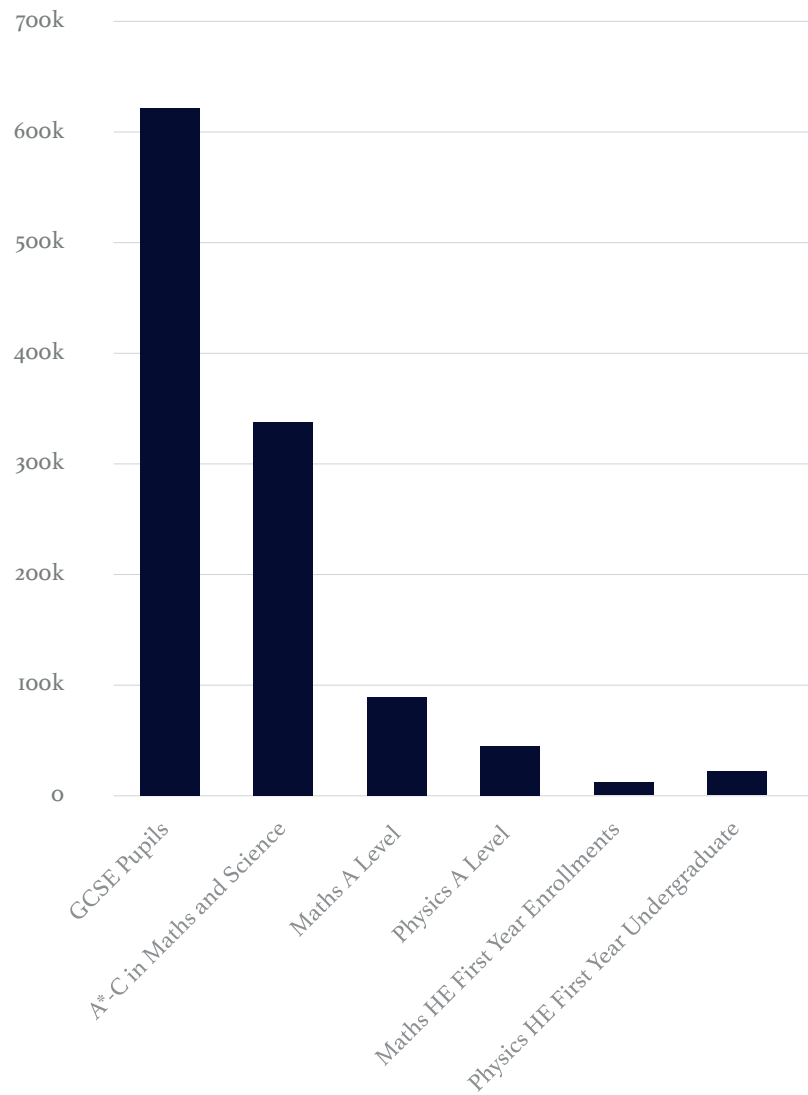
Quantitative skills are not only cumulative; they often require constant practice to stay fresh.

The following graphs shows three things:

1. The cohort of pupils in England who took GCSEs in 2011/12, A-Levels in 2013/14, and entered university in 2014/15. The precipitous drop in those studying Maths and science at an advanced level after GCSE makes it very difficult to transform STEM numbers and skills further down the pipeline. This has long been the case, but as the need for STEM graduates has increased, the percentage has not kept pace.
2. The percentage of students at university studying STEM subjects (a little above a quarter) versus other subjects. Science graduates form 27% of all graduates. Physical scientists (including chemistry and material science, for example) form 4% and mathematicians a little under 2%.
3. Recent government progress, of which there has been some. The final chart shows the number of students studying STEM subjects at A-Level. Maths, in particular, has shown an increase after concerted effort by Government and others.

¹¹ Nuffield Foundation, The State of Mathematics post-16, http://www.nuffieldfoundation.org/sites/default/files/files/Mathematics_after_16_v_FINAL.pdf

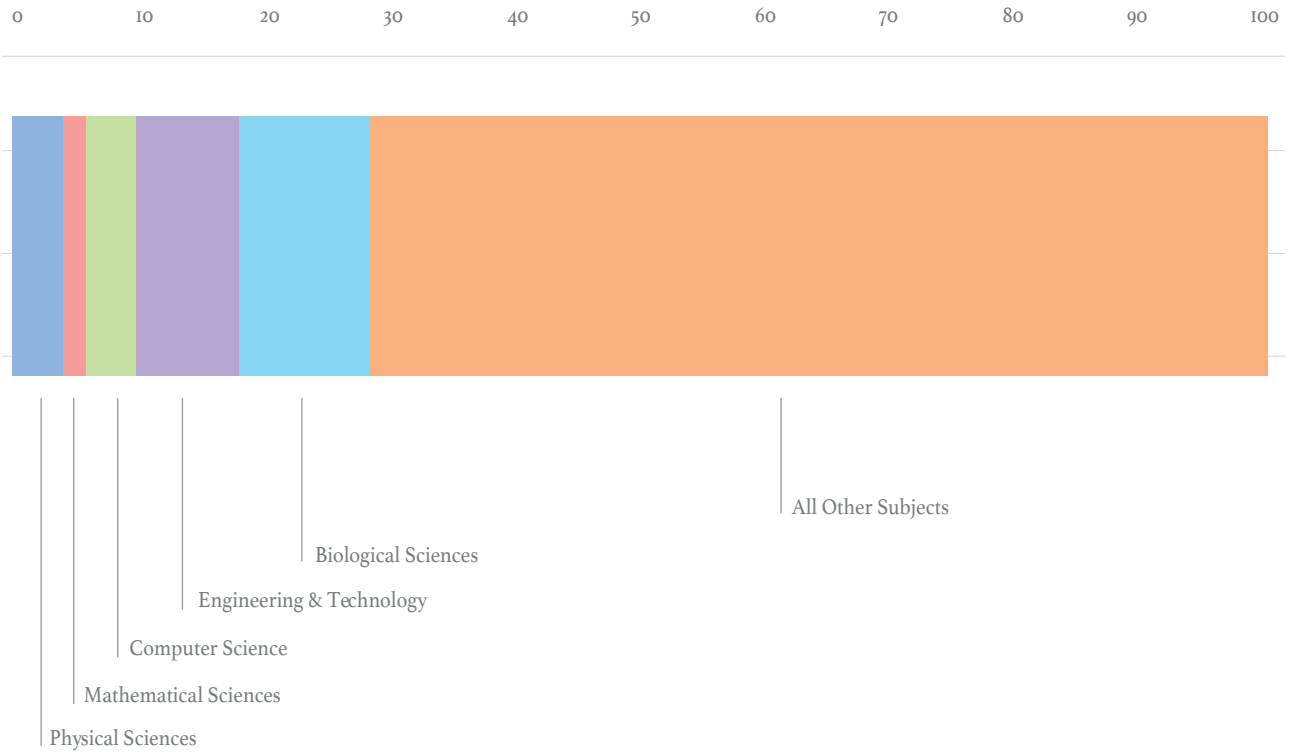
Stem Pipeline



(Source: DfE performance data; HESA data¹)

¹ DfE GCSE statistics, Main tables, Table 1, <https://www.gov.uk/Government/statistics/revised-gcse-and-equivalent-results-in-england-academic-year-2011-to-2012>

Students in STEM subjects



But we have reached a plateau: a staggering number of organisations and initiatives have been set up to improve STEM education. The chart below, by the Royal Academy of Engineering, attempts to categorise them. The ability for yet another small initiative or organisation to transform the STEM landscape seems limited.

(Source: DfE performance data; HESA data)

STEM education landscape

Diversity organisations	Mathematics community	Museums / Zoos Discovery Ctrs	STEM teacher support and supply	Government and agencies	Charitable trusts & foundation	Science community
WISE Athena Forum Inter Engineering AFBE-UK WES Your Life 10+ additional	JMC LMS RSS IMA 20+ additional Computing support	Science Museum Techniquest Nat Space Centre Winchester Sci Centre @ Bristol 50+ additional Engineering bodies	Design and Technology Assoc (DATA) STEM Learning Assoc of Science Educators (ASE) Computing at School NAACE (ICT subject assoc) NCEM London Knowledge Lab Maths Hubs Teach First Teaching Leaders Brilliant Club Awarding bodies	Dept for Education Dept Business, Innovation and Skills National Careers Service National Apprenticeship Service HEFCE / HEFCW ETF OFQUAL OFSTED NCTL Careers and Enterprise Co. UKCES Employers and bodies	Salters Institute NESTA Gatsby Foundation Wellcome Trust Nuffield Foundation Lloyd's Register Ogden Trust Comino Fnd Sutton Trust ERA Foundation 1851 Commission Reece Foundation Edu Endowment fund Livery Companies STEM policy bodies	Royal Society Royal Soc Chemistry Royal Soc Biology Inst of Physics Royal Institution Science Council Royal Society of Edinburgh Royal Astronomical Society Geological Society of London British Science Association Learned Society of Wales 70+ additional learned societies
STEM activities / providers Big Bang Fair Tomorrows Engineers EDT Smallpeice Trust Young Engineers Primary Engineer Arkwright Trust STEM in schools STEMNET Industrial Cadets Imagingering EESW 300+ additional	Raspberry Pi / Code club Apps for Good Coderdojo Stemettes Young rewired state Education providers Schools FE colleges 6th form colleges UTCS National Colleges ILPs / GTAs / ATAs National skills academies	Royal Academy of Engineering Engineering Council Engineering UK Inst Mech Eng The IET Inst Civil Eng Inst Chem Eng Inst Struct Eng CIBSE IOM3 IMarEST 30+ additional				

Table 1: An illustration of the complex STEM education landscape that highlights just a fraction of the organisations engaged in various types of activity.

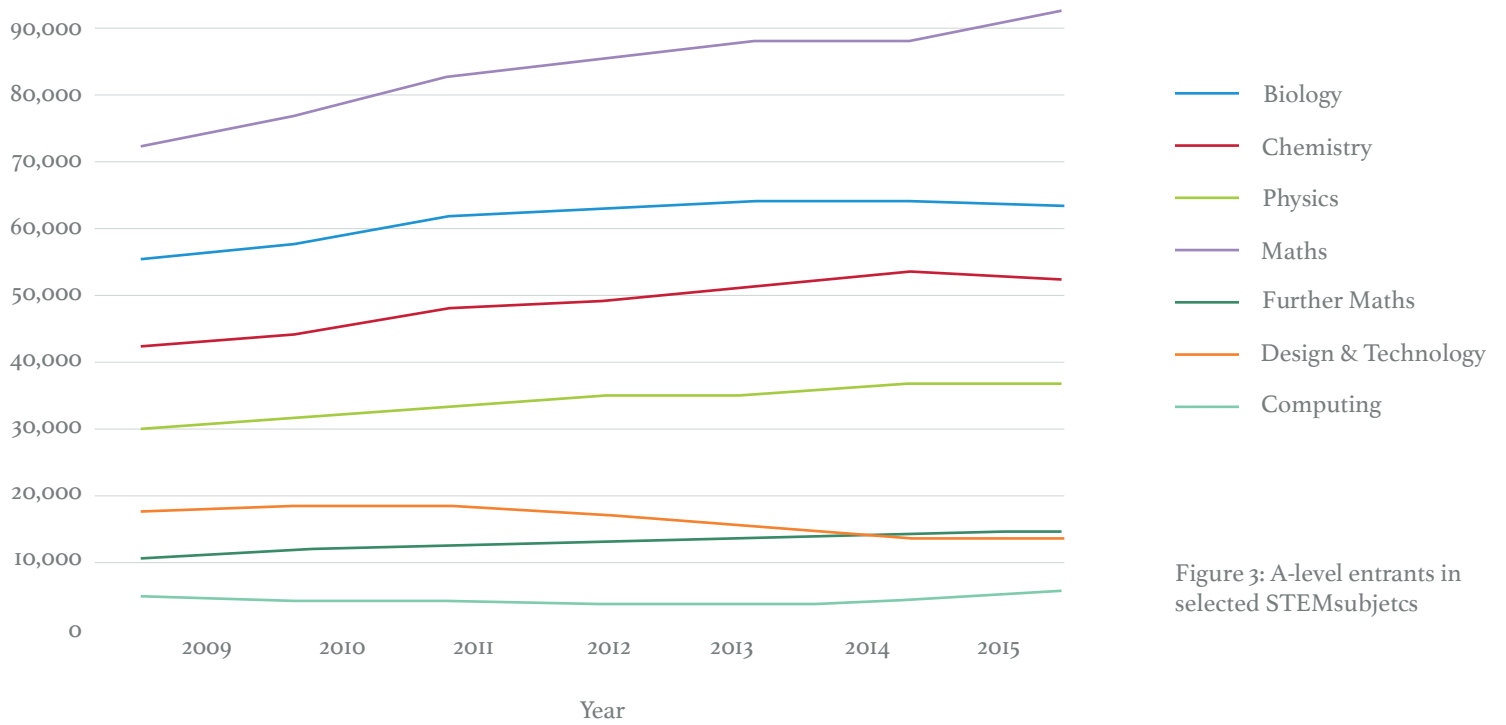


Figure 3: A-level entrants in selected STEM subjects

II. Recommendations

Every startup we talk to highlights the need for more STEM skills. Those companies in A.I. and data science are particularly worried at the lack of mathematicians and physicists. The only way we are going to change the situation is to dramatically increase the pipeline.

The only way to increase the pipeline, in turn, is to increase the proportion of 16-19 year-olds doing mathematics and STEM subjects to a high level. We have now

created a number of qualifications and courses designed to encourage this – Core Maths being the latest, and one of the best, examples. They have minimal impact on the traditional system because university entrance, employment, and ‘passing’ 16-19 education are not affected by doing these courses. They are entirely voluntary.

The Government has three key options. It can:

- a. Make mathematics compulsory for students in 16-19 education, with a number of possible levels. For example, A-Level standard, AS-Level standard, core maths’ standard, and GCSE standard. This is currently being investigated by Sir Adrian Smith, with a report due imminently.
- b. Force universities to amend their entry criteria to include mathematics, for example by introducing an SAT-style exam in Maths (which is the norm for American universities). Existing STEM qualifications, such as A-Levels, could be used as a proxy to give an automatic score.
- c. Enforce an SAT-style exam for university applicants, as above. Universities would have to state the score they sought, but could choose to ask for 0. However, the results and choices would be public and published and used in league tables.

Option C could be an intermediate step towards making mathematics compulsory for 16-19 year olds, ahead of the required shifts in the school system, which are:

Funding

Funding for 16-19, unlike the rest of school funding, has suffered large-scale cuts in recent years: 14% in real terms since 2011, with a further 8% cut in real terms by the end of this parliament¹². Meanwhile, other budgets have increased radically: the early years budget rose by 39% in the last parliament¹³, and will dramatically rise again in the next five years as the Government implements further childcare vouchers for 3 and 4 year-olds.

Requiring schools and colleges to increase their mathematics teaching under current funding conditions is extremely difficult. Almost a quarter (24%) of sixth form colleges have dropped STEM courses since 2011¹⁴. Moving the 16-19 school budget in line with pre-16 is a necessary pre-condition for this shift in policy.

Teaching

Because we have so few people, relatively, who study STEM subjects post-GCSEs, we also have a much smaller pool from which to recruit teachers.

This creates a vicious cycle. No Maths teachers mean people don't study Maths, which means in a few years' time there are still no Maths teachers. Every year, we miss existing targets on Maths and Physics recruitment.

Doing this unquestionably requires a number of changes – from reducing bureaucracy for schools to hiring non-EU teachers (for example by DfE becoming the sponsoring authority), to changing financial incentives and supporting new programs such as Now Teach. The new successful Maths Free Schools also offer the opportunity for better training hubs.

Technology also offers possibilities. A competition from Government for new accredited courses – akin to those described in the previous section on training developers – would stimulate the market.

¹² IfS, <https://www.ifs.org.uk/publications/8027>

¹³ FullFact, <https://fullfact.org/education/16-19-education-saw-largest-fall-education-spending-over-last-parliament/>

¹⁴ Sixth Form Colleges Association, http://www.sixthformcolleges.org/sites/default/files/SFCA%20spending%20review%20submission%202015_0.PDF

4) Basic Skills and General Education

England does extremely badly in international comparisons on basic skills. A recent OECD report¹⁵ found that young people were more likely to lack basic literacy and numeracy skills than their European contemporaries, even if they have completed degrees and high-level technical qualifications.

I. Share of Young Adults With Low Basic Skills

Qualification level	Average of OECD Survey participants	England
Below level 2	29.8%	48.0%
level 2 and 3	15.0%	20.7%
Post-secondary non-university (UK level 4 and 5)	10.2%	21.4%
University (UK level 6 and above and some level 5)*	3.6%	6.9%

Basic skills achievement is also geographically patchy. Last year, 64.8% of pupils achieved a C or above in Mathematics GCSE¹⁶. But in Knowsley, it was just 46.2%. Below is a list of the bottom 20 local authorities for GCSE pass rates in Maths. As is immediately obvious from the list, poor performance is concentrated outside London and the South, and particularly in the North West and the Midlands.

Local authority	% Maths (C+)	Region
Knowsley	46.2	North West
Kingston upon Hull	54.6	Yorkshire and the Humber
Blackpool	55.7	North West
Salford	56.8	North West
Isle of Wight	56.9	South East
Nottingham	57.3	East Midlands
Bradford	57.8	Yorkshire and the Humber
Sandwell	57.8	West Midlands
Stoke-on-Trent	58.8	West Midlands
Middlesbrough	58.9	North East
Peterborough	59.9	East
Manchester	60.6	North West
Leicester	61.1	East Midlands
Southampton	61.7	South East
Lewisham	61.7	London
Liverpool	61.8	North West
Luton	62.0	East
Dudley	62.0	West Midlands
Oldham	62.1	North West
Derby	62.1	East Midlands

15 <https://www.oecd.org/unitedkingdom/building-skills-for-all-review-of-england.pdf>

16 GCSE and Equivalent Results, 2015/16 (Provisional), Department for Education

Results are also worse for disadvantaged students: only 41.1% of students in receipt of Free School Meals (FSM) attain GCSE English and Mathematics by age 19, compared to 68% of their peers.

Why is this happening?

When you look at other international comparisons, the evidence is puzzling. In the Trends in International Maths and Science Study (TIMSS) the UK does not perform at the very top, but performance is high and has improved. In PISA, the other well-known international study, the UK does not perform as highly as we would like, but it is above average in science and reading, and around average in Maths. The basic skills picture is far worse.

One possibility is the age at which these studies are taken. The TIMSS study is taken by 10 and 14 year olds. PISA is taken when students have just turned 16 (give or take a few months). This hides a major difference between England and its competitors in Europe and the OECD: English students stop studying mathematics and their native language (English) much earlier than in other countries, regardless of their success.

Other countries see Maths and their native language as cornerstones of education. The figures below show the percentage of the 16-18 cohort that continue to study Maths (the native language figures are usually the same or even higher).

Proportion of post-16 students studying any Maths¹⁷

All (95-100%)	Czech Republic, Estonia, Finland, Japan, Korea, Russia, Sweden, Taiwan
Most (81-94%)	Canada (BC), France, Germany, Hungary, Ireland, USA
Many (51-80%)	Australia (NSW), Netherlands, New Zealand, Singapore
Some (21-50%)	Hong Kong, Scotland, Spain
Few (6-20%)	England, Wales, Northern Ireland

This is an enormous difference (though, again, Scotland is somewhat better). The most productive countries take basic skills more seriously than we do.

¹⁷ Nuffield Foundation, 2014 "Mathematics After 16: The State of Play, Challenges, and The Way Ahead"

There has recently been some attempt to change this. Firstly, it is now compulsory to continue studying and retaking English and Maths GCSE after 16 if you do not pass. Secondly, there has been concentrated work to provide mathematics qualifications that are between GCSE and A-Level. In particular, the excellent Core Maths qualification.

But these have had mixed success, because there is little incentive for students to do well. In most of these other countries, Higher Education institutions and employers expect students to have achieved a certain level in basic education. Passing the high school certificate, or equivalent, often requires Maths and a native language. In the USA, entry to Higher Education relies on Maths and English scores in the SAT. It is therefore incredibly important to students' futures that they show proficiency.

That is not true in England. While students do have to carry on sitting Maths and English GCSE, there is no good reason for them to pass – it doesn't make a difference to whether they achieve their qualifications overall. In 2013, only 14% of all students who retook an English qualification having not achieved a C, then achieved a C or above in that retake (or an equivalent Level 2 qualification). In Maths, the percentage was 13%.

While student incentives are low, the ability for institutions to act is also limited. The 16-19 education budget has declined by nearly 14% since 2010. Further education colleges, where the majority of students who have not achieved a C at GCSE study, lack specialised staff.

Why does this matter?

It is clear from the international comparisons that a higher level of basic skills is achievable. While the current method of asking people to retake the same qualification is demotivating, it is manifestly possible for us to raise the level of basic skills in this country.

Why does this matter so much for startups? Three reasons. Firstly, a high proportion of digital startups are dealing directly with consumers: they need to be able to interact intelligently and intelligibly. This is impossible without good English, and the smaller the pipeline of qualified people the more difficult it is to recruit. Secondly, it is vital that we increase the competitiveness of startups outside London and the South: there are natural competitive advantages in areas where wages are lower and houses are cheaper, but this is stymied if the level of basic skills makes hiring more difficult. Thirdly, basic skills are the gateway to all the other skills that startups need.

II. Recommendation

It recently became compulsory for those failing Maths and English GCSE to continue studying it between the ages of 16 and 19. However, the pass rate has remained very low, for three reasons:

1. Students need to study the GCSE, but they do not need to pass it. Attendance is very low partly for this reason.
2. Students are often highly demotivated after several years of poor Maths teaching.
3. The quality of Maths and English teaching in colleges, where the bulk of students who have failed GCSE will study, is often low.

To change the situation, we need to change the incentives:

1. It must matter whether people pass.
2. The qualification students take should not be the precise same one they were taking two years ago.
3. We need to find new, high-quality providers of Maths and English teaching for these students.

On the first point above, apprenticeships already require students to have passed at least functional Maths and English by the time they have completed the course. This should be raised to GCSE-level and applied to other courses in further education (and indeed to academic courses). For example, it should not be possible to enter university without the basics in Maths and English, except by unusual exception.

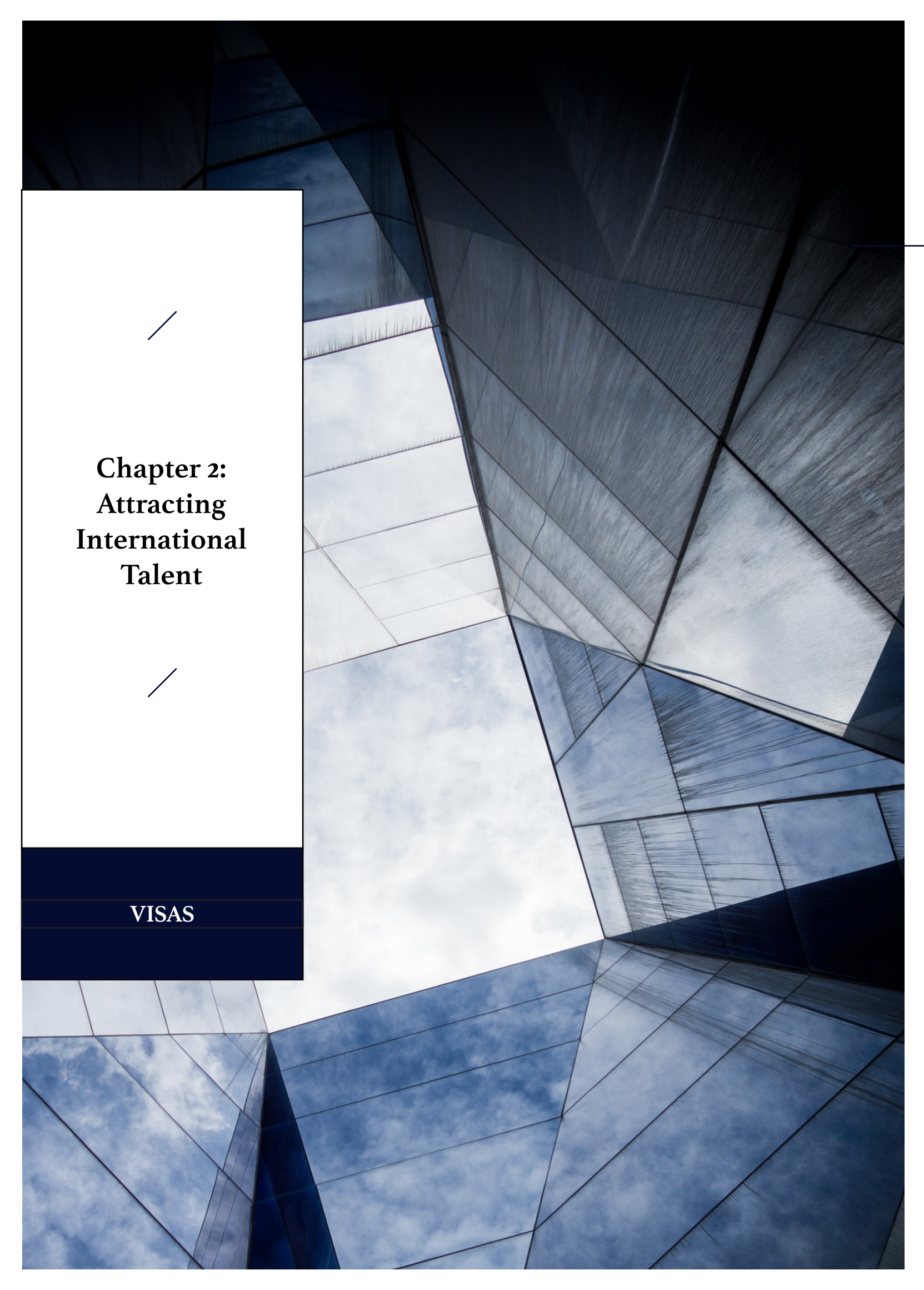
On the second, we should recognise that while the content of Maths and English GCSE must be mastered, there is something particularly patronising and demoralising about sitting in a room answering the same questions you were given as practice papers when you were 14.

If you look at sample Maths GCSE papers, they are full of school-context questions. For example, an AQA specimen paper has questions about students who take a spelling test in class, or a boy doing a long jump in sports. The phrasing is child-

like (“Steph is solving a problem”). The specimen English Language paper contains comprehension questions about two pieces of writing, both about experiences in school.

An adult GCSE, with the same content but different questions and approach, would be much less irritating and patronising.

On the third point, the Education Endowment Foundation is already doing a lot of work funding randomised control trials in this area – seeking out methods and providers that are delivering results for 16-19 year olds. We think they, with the DfE, could go further in funding the development of promising approaches for testing and scale.



Chapter 2:
Attracting
International
Talent

VISAS

I. Introduction and headline recommendations

INTERNATIONAL talent and domestic education policy are inextricably linked. The poorer the domestic skills base, the more companies must look elsewhere for employees. One of the central aims of the Government's new industrial strategy – to improve skills across the country – is tied to its desire to reduce net migration.

On the other hand, all great intellectual and commercial flowerings – ancient Athens and Rome, Amsterdam, London, New York – have relied on a stream of brilliant people from elsewhere. Scientists and entrepreneurs flock to particular places. In the aftermath of Brexit, we want Britain to be such a place.

This chapter, therefore, looks at immigration of the highly skilled. As we discussed in the education chapter, the most commonly cited recruitment needs for tech startups are developers and science, technology, engineering and maths (STEM) graduates.

Our aim is for the Government to make it substantially easier for startups to hire high-skilled talent from abroad. Startups rarely have the money or ability to hire lawyers, to go through very long recruitment processes, or to have people solely dedicated to navigating bureaucracy. But their contribution to long-term growth is high.

That said, policy must work within the Government's aims. It is clear that ending freedom of movement is the primary goal in Brexit negotiations. The Government has reaffirmed its target to reduce net migration to tens of thousands. It is reasonable to assume, therefore – pending negotiations – that an EU migration policy will be as restrictive, if not more so, than current non-EU migration.

The Government has clear public support to reduce immigration, although sympathy for high-skill immigration is much higher. Therefore, we are not going to make a generic argument about the importance of immigration. Instead, we will consider policies that help the Government with its overall aim of controlling immigration, while maintaining the flow of high-skill people to startups and companies at every stage of growth.

To help us, we surveyed hundreds of startups for their views on and experience of immigration policy, providing us with far more quantitative and qualitative information than has been available to date. We used that survey to develop our policy recommendations, alongside input from Coadec's steering committee.

It is clear that the majority of startups would like a liberal immigration system, which prioritises the highly skilled probably through a points-based system. That is not the Government's intent. Given that, we have proposed the following to work within the Government's immigration system:

1. To allow the high skilled into the country through a minimum six-month visa to enter the UK and seek work for those who:

- Studied at particular top institutions, or
- Pass a standardised, high-level exam in specific programming languages

This system would not replace the current Tier 2 visa process, but exist alongside it.

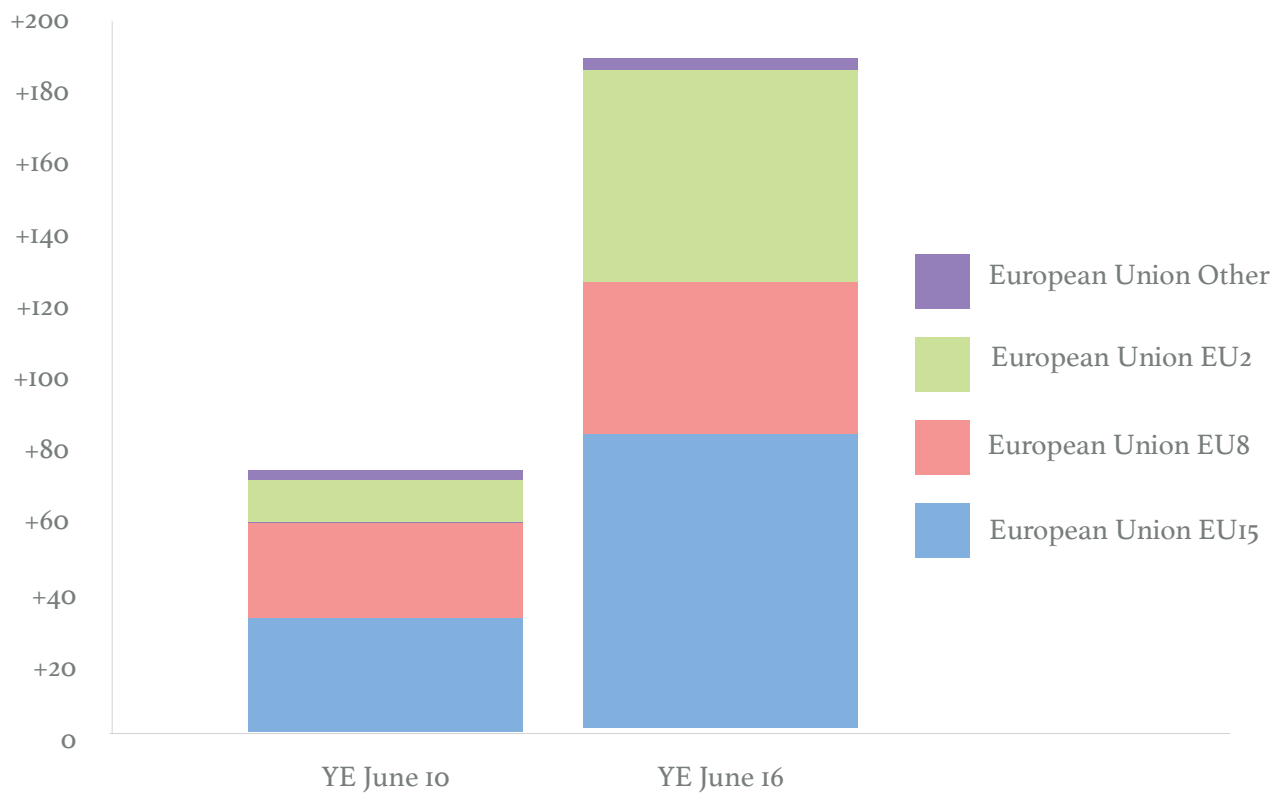
2. To radically reduce the burden for startups by allowing other organisations – such as venture capital funds, or large tech companies – to act on their behalf as Tier 2 sponsors.

II. Immigration in the UK

Net migration has been rising rapidly since 1997. Since then, annual figures for non-EU net migration have more than doubled, and EU migration has quadrupled.

Since 2010, non-EU migration has remained steady – although with significant changes from different regions. For example, there has been a rapid decrease in net migration from South Asia, and increases in migration from the Middle East and East and Central Asia. Meanwhile, EU migration has continued to increase very rapidly: by 2.6 times.

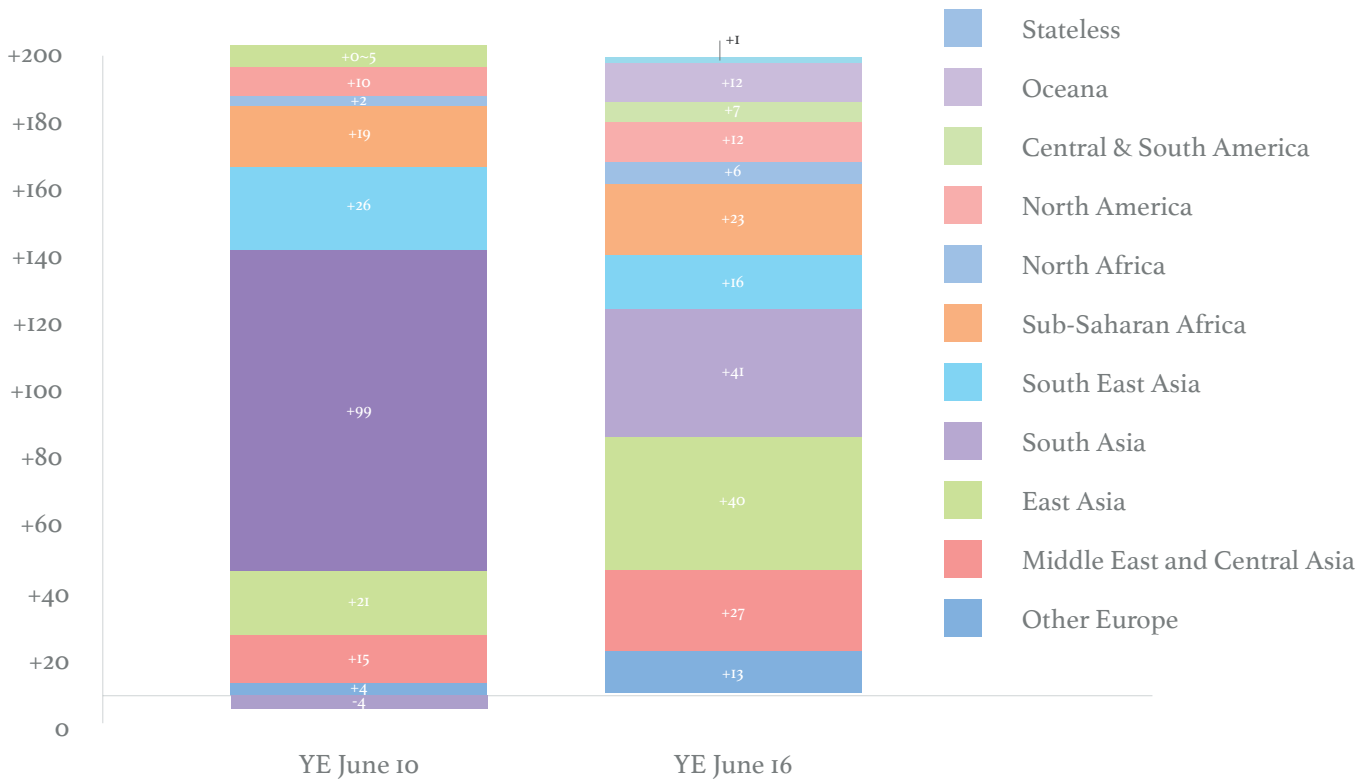
Net Migration from the EU: 2010-2016



(source: Long-Term International Migration, ONS¹)

¹ EU2: Bulgaria and Romania; EU 8: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia; EU 15: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Italy, Luxembourg, Netherlands, Portugal, Republic of Ireland, Spain, Sweden (the United Kingdom); EU other: Malta, Cyprus, Croatia. Long-Term International Migration, ONS.

Net Migration from non-EU: 2010-2016



Migrants come to the country for a number of reasons. From the EU, the main purpose is to work. More than two-fifths (41%) have a definite job when arriving, and a further 31% come to look for a job.

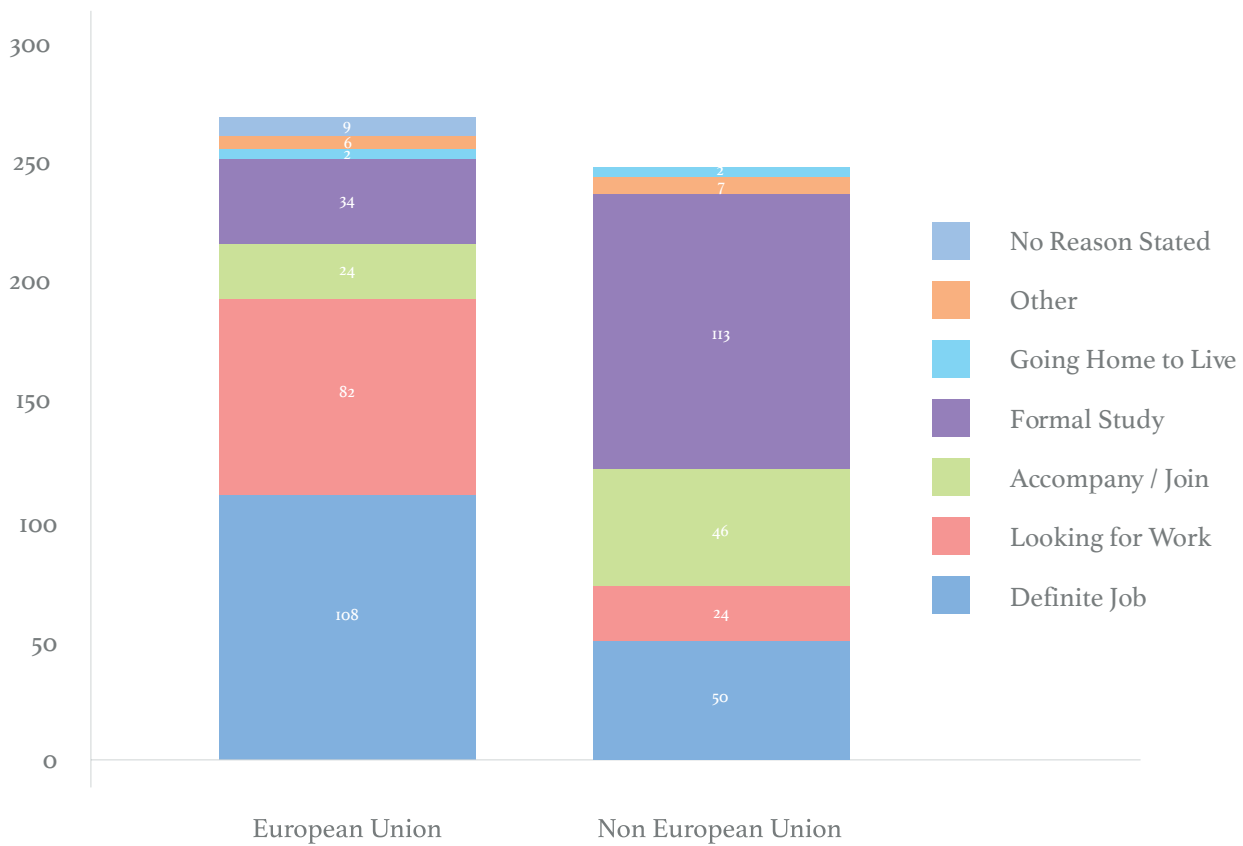
In addition, 13% of EU migrants come to study¹ and 9% accompany or join members of their family.

Outside the EU, there is an immigration policy (where the EU has none), so the reasons for migration are different. Almost half of non-EU migrants (47%) come to study: although fees are high, the existence of higher education organisations to sponsor and organise visas helps people enter for temporary study. More than a fifth (21%) come to take up a definite job, and a further 9% are looking for work². Almost a fifth (19%) accompany or join members of their family.

¹ There is an issue with a very large gap in net migration for students, which is not the focus of this report.

² Probably a combination of Tier 5 visa holders, non-EU spouses of EU citizens, spouses of Tier 2 visa holders.

Reason for Migrating: Y/E June 2016

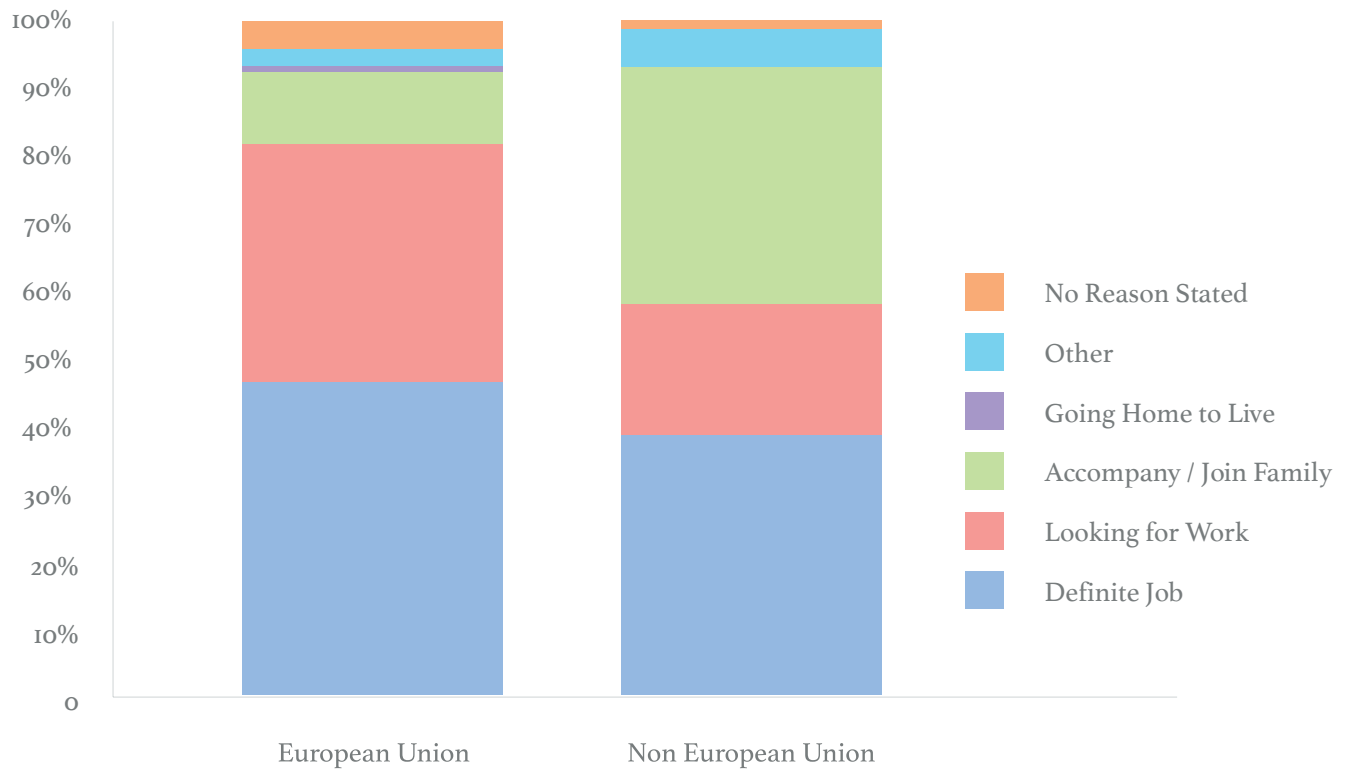


(Source: IPS estimates y/e June 2016, ONS³)

If you exclude people coming for study, there is a major difference between EU and non-EU migrants. The former group is much more likely to enter the country looking for work, since they are allowed to, and the latter group is much more likely to enter the UK for family reasons.

³ <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/internationalmigration/bulletins/migrationstatisticsquarterlyreport/dec2016>

Make-up of Inward Migration by Reason (excluding study): Y:E June 2016



(IPS estimates y/e June 2016, ONS)

How much of this is skilled immigration?

We don't know how many people moving from the EU are coming as skilled migrants. However, we do know how many non-EU citizens are awarded skilled work visas, called Tier 2 visas⁴. For startups, Tier 2 is the only way to hire non-EU workers.

In the last year, just over 90,000 Tier 2 visas were awarded. Of these, 17,669 were for general Tier 2 visas – the type that startups usually apply for. This is less than ten per cent of non-EU migration.

⁴ <https://www.gov.uk/Government/publications/immigration-statistics-january-to-march-2016/work#further-analysis-skilled-work-tier-2>

Type of Tier 2 visa	Number
Tier 2 general	17,669
Intra-company transfers	2,203
Short-term transfers	21,676
Long-term transfers	12,867
Ministers of religion	388
Sportspeople	111
Work permit holders	47

However, the annual Tier 2 total is lower than the annual cap of 20,700 allowed by the Home Office. The Government’s argument, therefore, is that supply is outstripping demand – at least while we remain in the EU. The cap was, in fact, met for a period last year. The Government awards the visas through a monthly cap, and if the cap is met it can change the criteria for the following month to reduce numbers. This rule raises major concerns for startups that criteria will be changed unpredictably.

That said, the cap on Tier 2 visas is not the main issue – perhaps unsurprising, since the criteria are set so that the cap is not regularly met. Startups report that cost, bureaucracy and time are the main constraints to hiring skilled migrants: in other words, the conditions the Government places on visas precisely to ensure numbers stay down.

3. Coadec’s exclusive startup survey

Coadec conducted an exclusive survey of tech startups to gain a better understanding of whether startups are facing barriers when applying for employee visas, and whether there are credible reasons for these barriers.

We surveyed around 150 tech startups to understand their experience of non-British workers and the immigration system. We were particularly interested in their early, critical period: the first few employees they hired, who tend to dictate the success and growth of the company. The startups were diverse: from those focused on public sector problems (health and education tech) to FinTech and e-commerce businesses.

1. Startups: small but international

The vast majority of those companies surveyed are still very small: fewer than 50

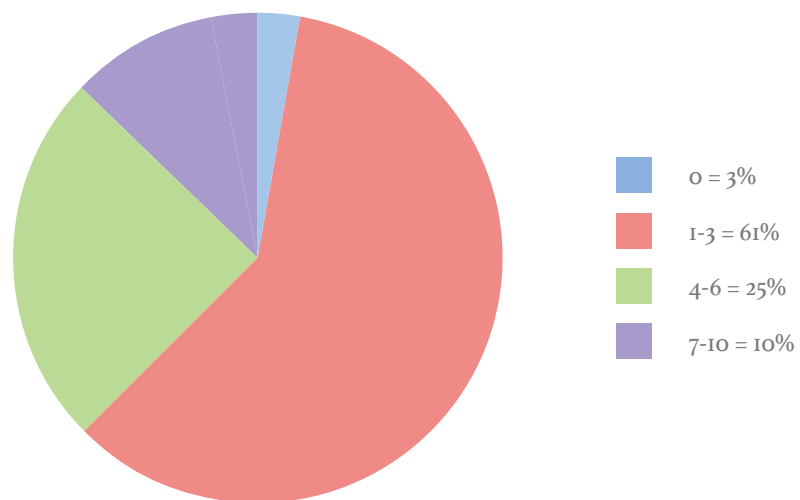
employees. Nevertheless, their employees are highly international. Three quarters of the startups had hired EU employees, and half had hired non-EU employees.

How many employees does your business have?

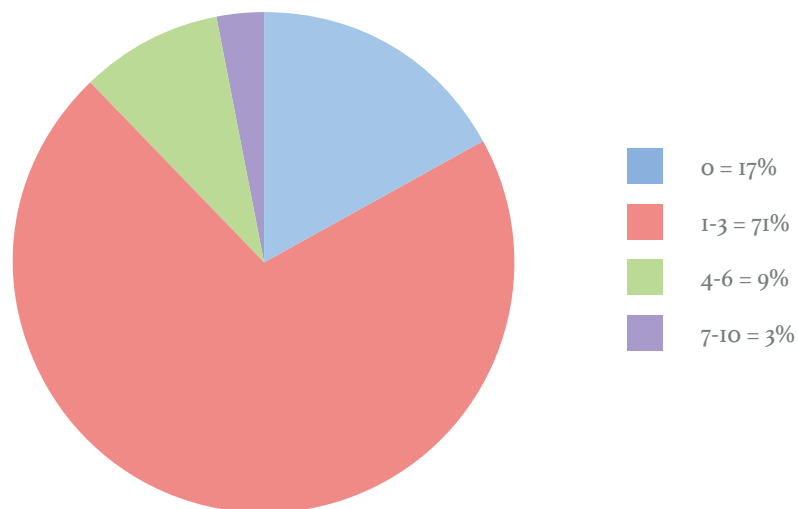
1-5	34%
6-10	19%
11-20	14%
21-50	12%
51-100	12%
100+	6%

We were particularly interested in the experience of startups during the companies' earliest days. We asked our respondents how many of their first ten employees came from within and outside the EU respectively.

Of your first (up to ten) employees how many were EU citizens (non-UK)?



Of your first (up to ten) employees, how many were from outside the EU?

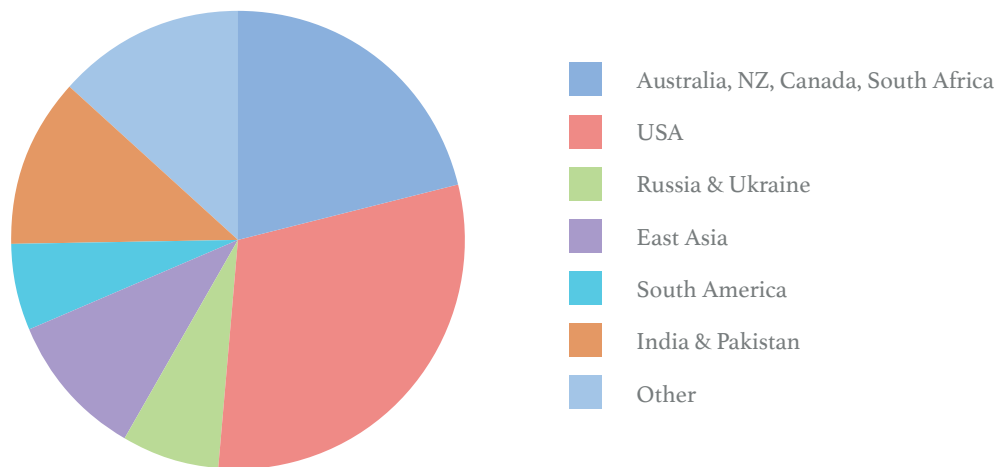


On average, a third of tech startups' first ten hires came from outside the UK. This is a very international picture – although not unique to Britain. Founders of tech companies in the US are also more likely to be international. This trend may be partly due to the value of international experience. A recent report from Balderton Capital found that 40% of tech founders studied outside the UK, with INSEAD and top US business schools featuring heavily on the list.

The first ten hires at a startup are likely to be very highly skilled, and dominated by developers and engineers. The heavy reliance on foreign employees signals the shortage of these skills within the UK workforce.

2. The US, Canada and Australasia are over-represented

We also asked which country the first ten hires had come from. Interestingly, the makeup of employees in Coadec's study differed from the national picture, which includes large inflows from Asia, the Middle East and Africa. Coadec's study showed greater migration from North America, New Zealand and Australia.



This is relevant because economic conditions and education levels in the US and Australasia are highly competitive with the UK, and the same skills are in high demand. Therefore, people moving to UK startups from these countries will only do so if the compensation and process make it worth their while, and if London and the rest of the UK remain highly attractive and exciting places to live.

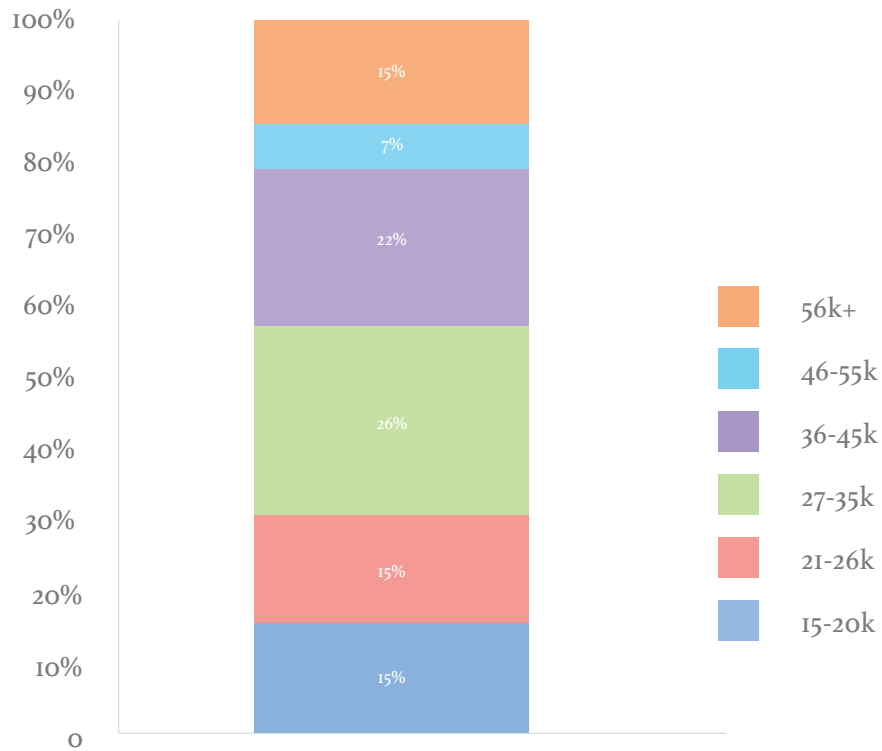
This trend is also probably a reflection of the Tier 5 visa route, which makes it easier for people from countries such as New Zealand and Australia to enter the country. Startups predominantly hire those people already here. This is one of the most important findings of our survey.

3. Salary a poor reflection of compensation

More than half (55%) of those hiring from outside the EU offered substantial non-salaried compensation, such as equity. Almost two-thirds (60%) offered the same incentive to those within the EU.

This is unsurprising, since startups are riskier propositions than established companies. One way they attract the best people is by offering them a long-term stake in the growth and success of the company. This helps explain the relatively low salaries (under £26,000) of 30% of non-EU hires. This compares to average salaries of between £30,000 to over 60,000 for developers and designers in the UK.

Distribution of Salary for Early Non-EU Hires



This is a major concern in relation to future Tier 2 immigration policy, which will have higher salary thresholds. Requirements are entirely focused around salaries, when startups often focus on non-salaried compensation to attract the best employees.

4. High frustration with the visa experience

Immigration processes for startups are time-consuming and expensive for a substantial minority of those startups we surveyed. While over half (59%) took fewer than three months to apply for a visa – still a long time for a startup – 33% said it took 4-6 months, while 6% said it took 7-9 months.

A third of startups said it cost £6,000 to make a single hire. Much of this sum was spent on legal fees.

However, complexity and time are of greater concern to startups than cost. Almost three-quarters (70%) of respondents said bureaucracy and time is a major barrier, while only 40% cited cost. A number of those we surveyed said they considered hiring from outside the EU, but decided against it after studying the visa process.

The part of the process most frequently cited as frustrating for startups is the Resident Labour Market Test (RLMT), whereby companies must advertise a position domestically, before offering it to an international candidate. Early-stage companies rely on speed far more than large, established organisations.

The second-biggest frustration is the process of being recognised as a suitable company – unsurprisingly difficult for early-stage organisations. The Home Office has allowed a number of exemptions to the RLMS, including those on the shortage list and STEM PHD graduates. But it is still a substantial constraint for early-stage startups.

The other major issue for startups is that the company's founder often has to spend time on the sponsorship process, rather than delegating the task. Very small companies do not employ enough people, or have sufficient overheads, to delegate.

“I was told that I should have advertised the CTO position in a job centre if I wanted to hire a US national. The civil servant who interviewed me about the role asked what a CTO does. I explained in huge detail. Her reply: “My son is good with computers though, we always go to him when it breaks. What’s so special about this guy?”

“It took us several attempts to get the Home Office to recognise our company as a company of reputable standing, despite our regulated standing with the Financial Conduct Authority and wide coverage in the media and Government. Eventually, we had to get the UKTI to write a letter to the Home Office explaining this, and that helped us get accepted onto their database.” [FinTech company]

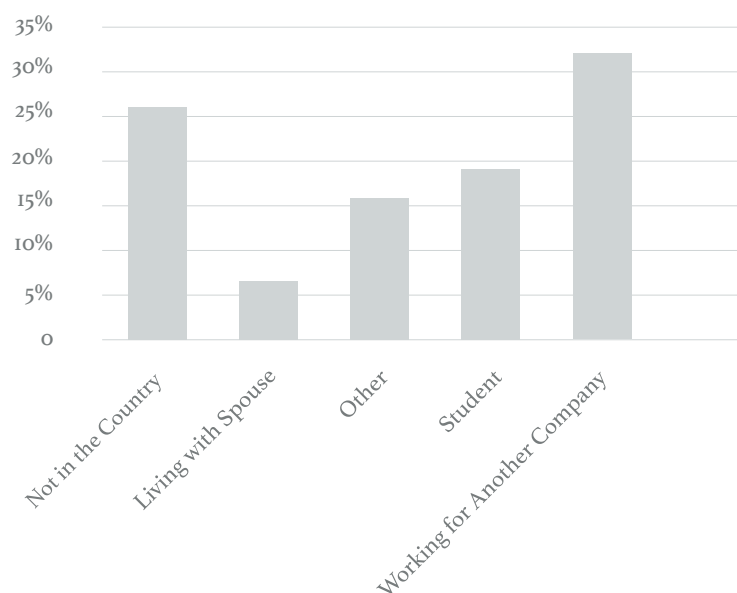
“Our co-founder was from outside the EU, and the process of getting him here took so much time and effort that we missed out on an exit opportunity. The acquiring firm wanted him in the country for three years, post-exit. These are standard terms, but the UK Border Agency was hopelessly inefficient.”

5. Hires lost because of the visa process

Just under half of those startups who had hired from outside the EU lost good candidates during the process. For a third of those, this was a direct result of the complexity of the visa application system.

6. Most non-EU hires already in the country

Employees Previous Residency in UK (and reason)



Of those who had hired from outside the EU, 75% of their hires were already in the country – often as students or working for another company. Particularly in the earliest stages, when the risk of a bad hire is enormous, founders employ those they meet and like, particularly if they have to jump through administrative hoops. This highlights the importance of other immigration routes for startups, who are extremely unlikely to hire people ‘cold’ from other countries. It also suggests that allowing people to be in the country to seek work is important for the highly skilled.

7. Startups are looking for specific skills, qualification, and experience

We asked startups whether there are objective markers on a CV that allow them to determine whether they wish to hire someone. Many said no – they rely on inter-

views and a range of criteria to judge applicants. But a significant proportion (70%) of those who responded to the question named one of three criteria:

1. A university degree from a recognised top university in a relevant degree. For example, a degree from Harvard, MIT or Insead, or a Maths degree.
2. A particular development skill – almost always a programming language, such as Python
3. Experience at specific companies. Either major companies, such as Google and Netflix, companies with deep sector expertise in areas such as A.I. or cybersecurity, or startups in similar fields.

This is important because it indicates clear, objective criteria by which people could be characterised as 'high skilled' in the tech sector.

3. Recommendations

Most startups and investors in tech would like a highly liberal immigration regime, where high-skilled workers can enter and stay in the country with a minimum of bureaucracy for the employer and employee. There is widespread support for a points-based system.

In conversations with startups, the visa system is invariably the first issue raised in terms of Government policy, followed closely by domestic skills. This is partly because the Government has made concerted efforts to improve the environment for startups in other ways. But it is also because startups rely on talent, and they find it harder to cope with bureaucracy and time costs than larger companies.

However, the UK Government is not going to move to such a regime. It has committed to reducing net migration within a system that already makes it virtually impossible for low-skilled workers to enter from outside the EU. Each of their main work visa categories – Tier 1, Tier 2, and Tier 5 – focus on skill.

What then, would be a sensible way forward for a Government that is simultaneously trying to improve productivity and growth, create a satisfactory skill base in the UK, and establish Britain as a centre of innovation and ideas?

In Coadec's view, some of the most interesting results from our survey are:

1. That startups have a bias towards hiring people already in the country, even if they came from outside the EU.
2. That startups rely more on workers from America, Canada and Australasia than business as a whole.
3. That the bureaucracy of the visa process is so frustrating it results in many highly skilled people being lost from the system.
4. That startups have very similar requirements for their early hires.

Our recommendations reflect these findings.

Specifically, the Government must reduce a) barriers to remaining in the country for high-skilled potential employees, and b) bureaucracy for employers.

We have addressed each of these points in turn.

I. Reducing barriers for high-skilled potential employees

The criteria listed by our startups suggest a way in which the Government could allow the most skilled to come into the country and look for work without relaxing quality.

Many of our startups listed one of three criteria – degrees from certain universities, ability to program in specific languages, and experience at certain companies – for their top hires. The first two of these are objective and measurable. It is easy to know if someone has studied at a specific university, and companies commonly use tests to determine developers' ability to program.

Therefore, our recommendation is that the Government should allow a minimum six-month visa to enter the UK and seek work to those who:

- Studied at particular institutions, or
- Pass a standardised, high-level exam in specific programming languages

This policy would give companies the chance to interact with top talent. Migrants would have to return home if they do not receive a job offer by the end of the six months. If an employer wished to hire them, we recommend that people on this visa should be exempt from the Resident Labour Market Test, which is the biggest drag on startups' time and growth potential.

The standardised exam could be set by industry experts, and updated regularly according to the market's changing demands. The test could be conducted by established institutions – for example, the British Council. Academic institutions could be assessed by their entry criteria, and graduate outcomes. We propose this should apply to a very small number of elite institutions for specific, high-demand degrees, such as STEM qualifications.

This system would not replace the current Tier 2 visa process, but exist alongside it. The speed and certainty would be extremely valuable for those startups that wish to know they can “definitely hire this person”, to quote one founder. As an initial step, the Government could pilot this approach with either Tier 5 countries (Australia, Japan, Monaco, New Zealand, Hong Kong, Korea and Taiwan) or countries with a similar economic development level to the UK. This would radically reduce the likelihood of fraud in the system.

II. Reducing bureaucracy for employers

Tier 1 visas are conducted through registered third parties. For example, Tech City has the Tech Nation Visa Scheme. Because Tier 1 visas apply to individuals, not companies, a different sponsoring authority is needed. With Tier 2, it must all be done through the sponsoring company.

But the process and bureaucracy of becoming a sponsored authority is high for small startups – as are the associated legal costs. By allowing other organisations – such as venture capital funds, or large companies to act on behalf of startups, the burden on very small organisations would be radically reduced.

We recommend that the Government should pilot this scheme with a small number of highly trusted tech companies, who would endorse companies just as Tech City endorses applicants. Once through this process, startups would be able to hire Tier 2 workers. One other possibility is that companies endorsed through this process could offer equity compensation in lieu of some salary requirements when hiring Tier 2 workers. As above, this could initially be piloted for Tier 5 countries.





Chapter 3:
Dynamic
UK-Wide
Growth

INVESTMENT

I. Introduction and headline recommendations

DIGITAL and technology startups began 2017 in a strong position. London remains one of the leading places in the world to access capital and scale a business. As many of the startups we speak to have remarked, capital is no longer the constraint, it's talent.

For instance, UK tech companies received £1.96 billion of venture capital investment in 2016¹. This was a fall of £80 million from £2.04 billion in 2015, but VC appetite remains high, providing there is a pipeline of talent. Meanwhile, UK pension funds, corporates, and individual investors are sitting on trillions of pounds.

- UK pension funds have \$3.2 trillion under management ²
- Grant Thornton calculates there is around £244 billion in cash sitting on the balance sheets of UK corporates (13.5% of GDP³)
- Individual investors have a combined capital of approximately £2 trillion⁴

In addition, the Government has a plethora of schemes to support startups, including the provision of venture capital via the British Business Bank.

However, there are a number of trends that should cause concern:

1. London is facing increasing competition globally for investment activity
2. UK-wide funds remain reliant on European funding
3. Fewer of our startups are growing
4. The total number of tech deals has fallen
5. There is growing regional investment divide

¹ London&Partners/Pitchbook 2016, <http://www.londonandpartners.com/media-centre/press-releases/2017/20170112-uk-tech-sector-leads-european-investment-in-2016>

² Global Pension Assets Study 2016, <https://www.willistowerswatson.com/en/insights/2016/02/global-pensions-asset-study-2016>

³ <http://www.grantthornton.co.uk/globalassets/1.-member-firms/united-kingdom/pdf/publication/2016/working-capital-report-digital.pdf>

⁴ The Growth Hunters 2016, <https://www.syndicatoroom.com/rise-of-the-growth-hunters>

It is essential that, as we exit the EU, we strengthen the position for startups across the country. The good news is there is huge scope to improve upon the way in which national and international investment is allocated. If the Government takes this opportunity to match investment but deliver it more sensibly, we could enter a golden age.

Our recommendations are therefore:

1. That the Government should seek continued collaboration with the European Investment Fund (EIF), as exists for other non-EU countries (e.g., Israel) but simultaneously amplify the commercial arm of the British Business Bank to prepare for alternative scenarios.
2. That the European Regional Development Fund (ERDF) be replaced, but include local private-led investor funds for startups and scale-ups, with reduced regulatory controls. This should be supported by new forms of tax relief for corporates looking to bring jobs and startup support to regional cities.
3. That the Government seek to incentivise pension funds. In particular, local Government pension funds should invest long-term in scale-ups.
4. That the Government apply a 'scale-up' tech test to all funds and incentive schemes to ensure that relatively small but growing companies can easily access capital.

Part 2: Trends

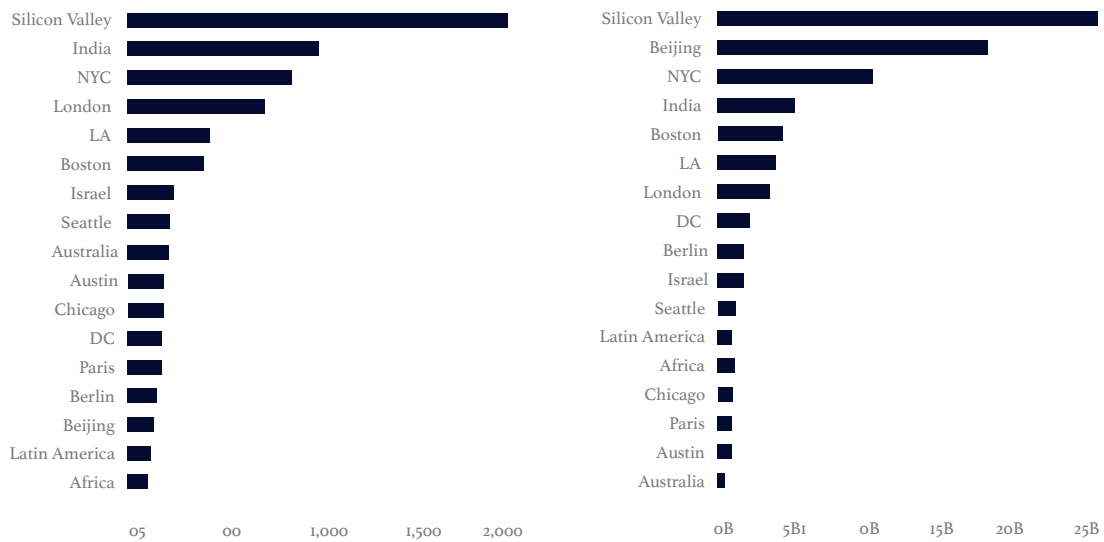
1. London is facing increasing competition globally for investment activity

At the global level, London sits fourth for funding rounds and seventh for invested amounts in the Crunchbase Global Investment Report 2016.

Meanwhile, startup ecosystems such as Beijing, Berlin and Paris have seen tremendous increases in investment activity and a broader presence of dedicated local investors, over a five- to ten-year timeframe.

Funding by Region

Invested Amounts by Region



2. We remain reliant on the EU

A number of venture capitalists and funds supporting fast-growth tech startups receive funding from the European Investment Fund (EIF), part of the European Investment Bank. In addition, the European Regional Development Fund (ERDF) is a second co-funded mechanism that supports a wide range of digital and technology initiatives across all Governments of the United Kingdom, as part of the European Structural and Investment Fund.

(Source: CrunchBase Global Investment Report 2016⁵)

- The EIF is a major investor in UK funds (2.3 billion euros from 2011 – 2015, 37% of all funds raised⁶). The prospect of the UK no longer having those funds to invest creates a high-level of uncertainty for the UK tech community.
- In 2015, the EIF's equity participations in the UK amounted to 655.8 million euros, which is expected to mobilise up to 2.87 billion euros in capital (x4.4). This includes funding for 144 UK private equity and venture funds and almost 30,000 small businesses⁷.
- The 2014-2020 budget for the ERDF is £2.9 billion, supporting initiatives such as accelerators; co-investment funds; JEREMIE funds (now the Northern Powerhouse Fund); innovation, digital and technology centres; capital grants and R&D support.

⁵ http://static.crunchbase.com/reports/annual_2016_yf42a/crunchbase_annual_2016.pdf

⁶ <https://www.investeurope.eu/research/activity-data/annual-activity-statistics/>

⁷ The EIF in the United Kingdom, 2016 http://www.eif.org/news_centre/publications/country-fact-sheets/EIF_Fact-sheet_UK.pdf

3. Fewer of our startups are growing

While there are a record number of UK tech startups securing seed investment (capital in exchange for an equity stake), the percentage of tech startups that proceeded to venture, and then to growth, has fallen each year since 2011. [Data for 2015 and 2016 seed funding rounds is not yet available]. A startup reaches the growth phase when it is five or more years old, generates substantial revenues (and likely some profit) and has both funding and valuation in the millions [Beauhurst definition].

The number of tech firms that raised a seed round and then proceeded to venture and growth, or exited

Base year	Recipients*	Seed (still)	Venture	Growth	Exited
2011	138	28	53	14	13
2012	214	68	75	16	11
2013	330	135	114	9	8
2014	439	251	118	4	11

(Source: Beauhurst⁸)

*seed-stage recipients of equity in base year

The percentage of seed companies that proceeded to venture and growth

Base year	Recipients %	(still) Seed %	Venture %	Growth %	Exited %
2011	100	20.3	38.4	10.1	9.4
2012	100	31.8	35.0	7.5	5.1
2013	100	40.9	34.5	2.7	2.4
2014	100	57.2	26.9	0.9	2.5

(Source: Beauhurst)

“A new artificial intelligence (A.I.) startup has been founded in the UK on almost a weekly basis in the past 36 months. But one in 10 UK A.I. companies is in the late ‘growth’ capital stage, compared with 1 in 5 in the US.”

David Kelnar, MMC Ventures

⁸ Beauhurst provides research and insight on the UK’s high-growth companies. Its customers include some of the UK’s leading organisations in professional services, investment, higher education and Government. The exclusive data in this report is specific to UK-based technology companies which raised equity investment, a key indicator of growth potential, from 2011 onwards. Find out more at www.beauhurst.com

A second equity gap exists for tech deals between £500-999k and £1-2m

Deal size	Number of deals
Up to 499k	1197
500-999k	510
1-2m	449
2-5m	507
5-10m	206
10m+	250

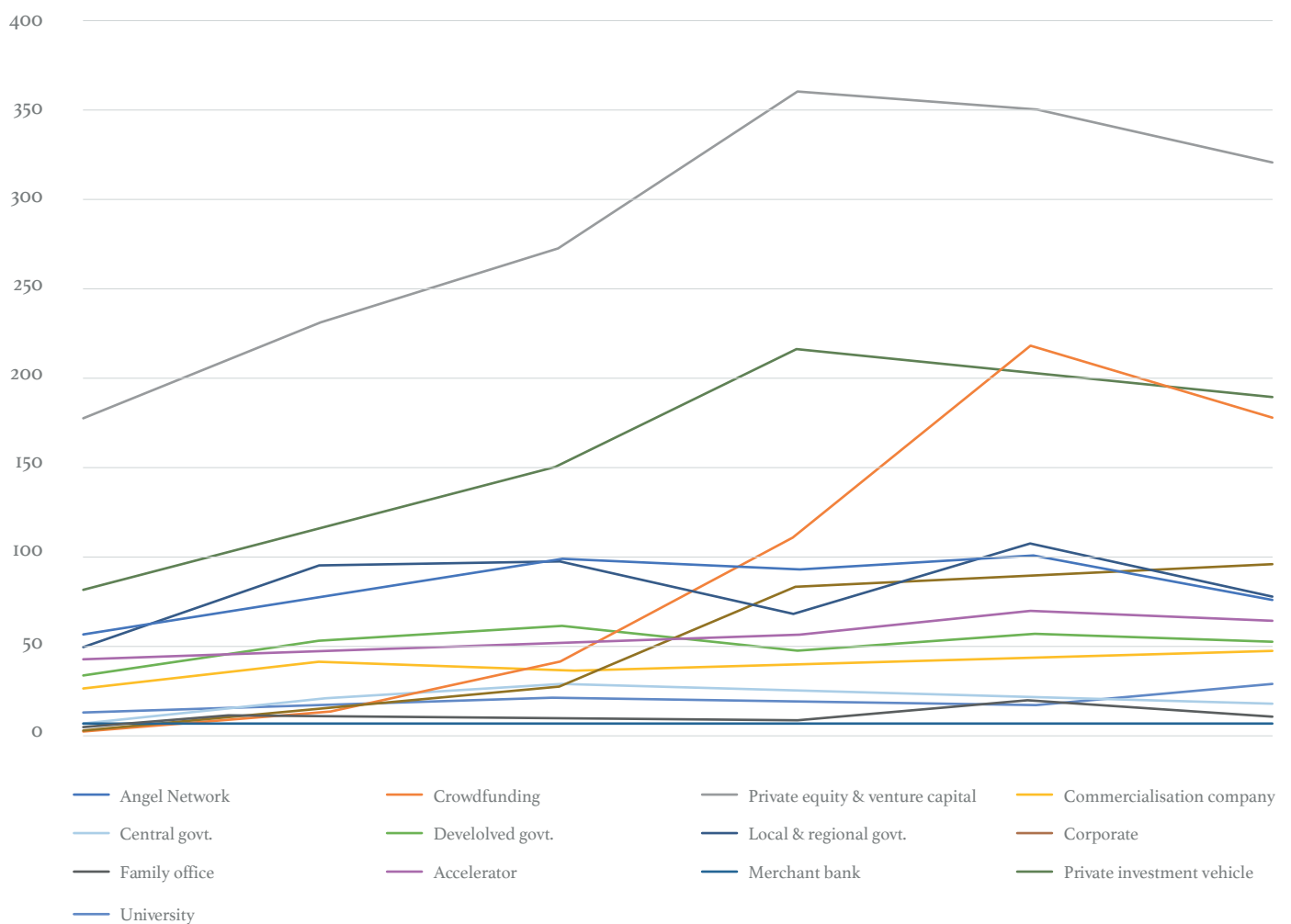
(Source: Beauhurst)

Although the sub-£500k category is the most common (as you'd expect), the £500-999k and the £1-2m brackets are around the same size (if not lower) than the £2-5m bracket. This suggests a gap in the number of deals in both those brackets.

4) The total number of investments in growth tech firms has fallen

Private equity and venture capital remain the most important sources of funding for growth tech companies, but the recent declining trend is concerning. In 2016, the total number of investments in growth tech firms declined by 19.8% year on year [however, this was also the case in the US with venture capital investments also down 11%] *ibid.*

Number of Investments by Type of Investor (2011-2016)

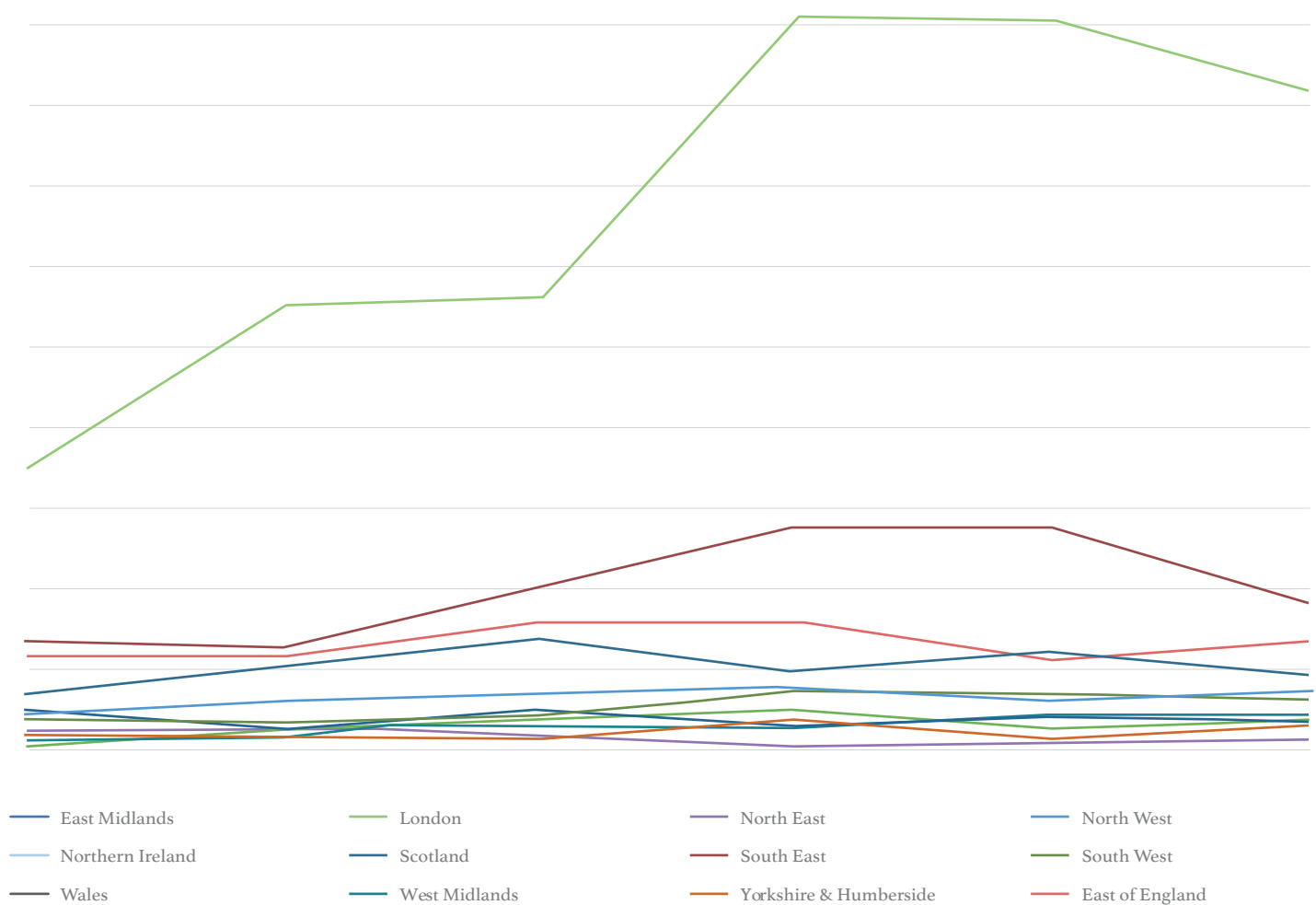


(Source: Beauhurst)

5) There is a growing regional equity divide, and outside the South East of England, regions rely heavily on the Government

An analysis of regional deal flow activity reveals the stark contrast between London and other regions across the whole of the UK. Private equity and venture capital investments in London form 52% of the national total. Moreover, investments dropped 16% in London in 2016, with no corresponding increase elsewhere in the UK.

Private Equity and Venture Capital Tech Deals by Year and Region



(Source: Beauhurst)

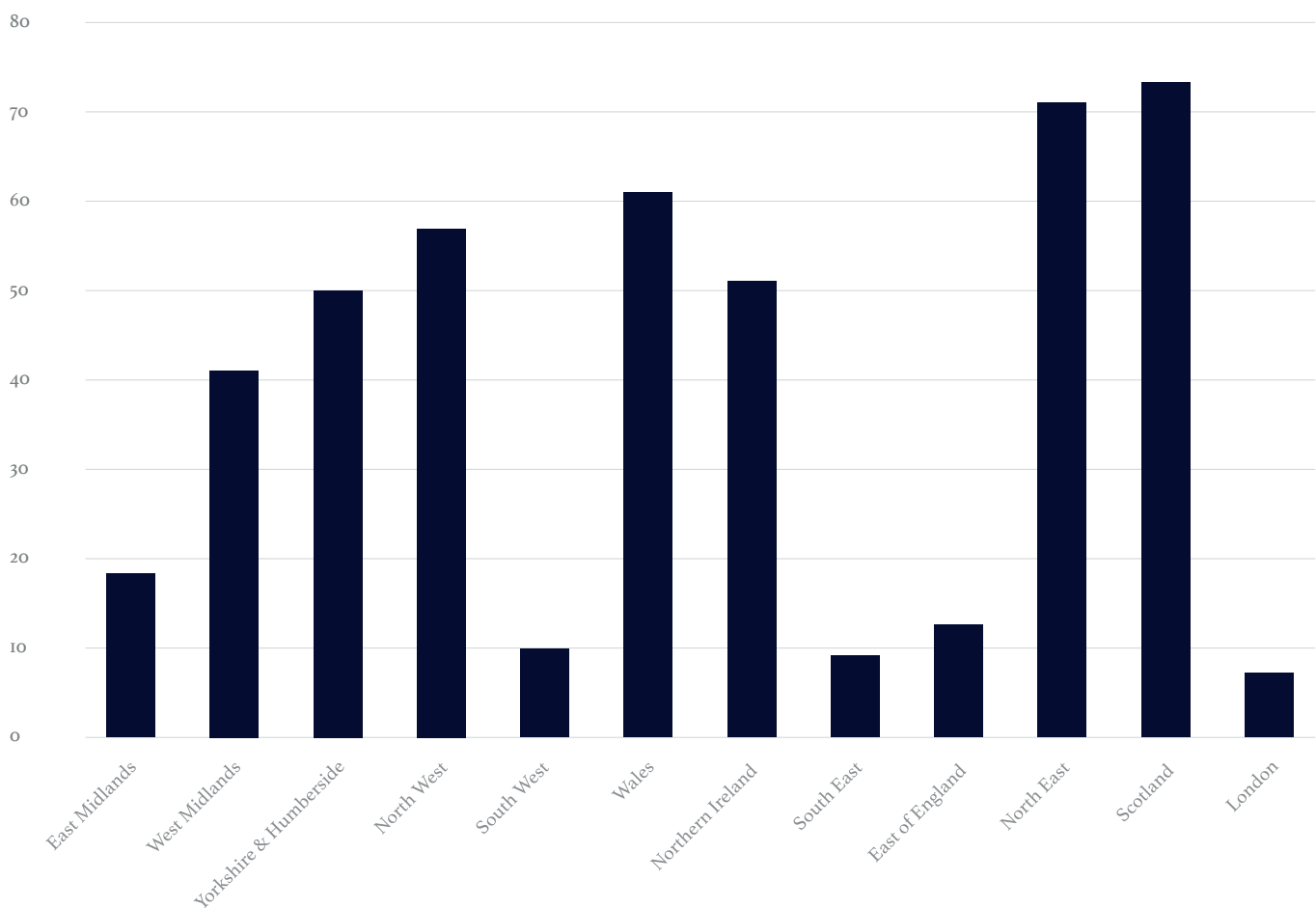
Regional analysis also reveals how Government involvement in high-growth tech companies has been critical in all regions except London, the South West, the South East and the East of England. This suggests there is a significant need – and opportunity – for private investor activity in most of the UK.

At the level of local authorities, the regional equity divide is equally stark. The five top boroughs (Westminster, Hackney, City of London, Camden, Islington) received 32% of total PE and VC investments in 2016.

In the same year, 80 local authorities received zero investment. The top borough, Westminster, received as many tech investments in 2016 as the 207 worst-performing local authorities combined.

To put it another way, Westminster performed better than more than 60% of local authorities combined.

Percentage Share of Investments with Government Participation



(Source: Beauhurst)

I. Leaving the EU: The European Investment Fund (EIF)

This section sets out solutions to the challenges outlined above, starting with the immediate concern of the UK's future relationship with the EU.

In Part 1, we highlighted the reliance of UK startups – particularly outside London – on devolved, national and EU Government funding. But that only looks at overall money and not at how sensibly it is allocated. This section highlights structural weaknesses in European funding and suggests ways the Government could adapt funding models as we exit the EU, strengthening the tech sector overall.

Recommendation 1: Taper the reliance on EU-backed funds by liberalising the British Business Bank

Our working assumption, given this Government's approach to Brexit, is that the UK will remove its stake in the European Investment Bank (EIB), unless other EU countries make up for Britain's shares to retain the EIB's lending capacity. The UK has a 16.11% shareholding of the EIB – worth 39.2 billion euros – making it one of the four joint main shareholders, alongside Germany, France and Italy. This is important for startups because the EIB is a major shareholder (60%) of the European Investment Fund (EIF), a public-private institution that plays an active role in facilitating access to equity for venture capital funds and early-stage startups.

Venture capital is an essential means for startups to achieve growth and create value through innovation, and the EIF has focused on seeding new venture funds with unproven track records. New funds have minimum amounts they must raise in order for them to close, and the EIF has helped boost these nascent funds over the initial threshold, where the uncertainty for other investors is highest.

There is some suggestion that the type of funding EIF provides is helpful. Bertoni and Tykova (2012)⁹ found that: “Syndicates between private and Governmental venture capital investors, in which the private investor takes the lead, are the most efficient form in terms of innovation production that outperforms all other forms.”

However, little or no empirical evidence has been produced regarding the impact of the EIF on the performance of the targeted startups and, in turn, the impact on the wider economy. The European Venture Capital Landscape report identifies the lack of evidence and concludes that further work “will pave the way to the final aim of this series: to assess whether the activity of EIF led to VC investments that positively affected the performance of the targeted startups”. Coadec recommends a detailed analysis takes place, in order to support the Government's exit negotiations.

⁹ ‘Which form of venture is most supportive of capital’

Our view is that continued collaboration with the EIF is beneficial for the UK. The EIF brings a pan-European investment portfolio, plus stability and reassurance for financial markets. The EIF is an active long-term investor that can absorb a proportion of the risk when investing in fast-growth tech startups. The UK is a leading market for the EIF and European investors, and the British Business Bank is already a key partner with the EIF on schemes such as the ‘Help to Grow’ growth loans. The EIF has also reached new financial agreements with organisations in countries “outside the territories set out”, if a decision to do so is made at the EIF General Meeting.

Given the need for a smooth transition process as we exit the EU, the British Business Bank must amplify the private sector expertise of its commercial arm, to become a stand-alone institution before we exit the EU. In context, the EIF currently employs 369 people while the commercial arm of the British Business Bank comprises a team of ten. The Venture Capital unit at the Department for Trade must also significantly increase its reach, to encourage inward global investment.

At the Autumn Statement 2016, the Chancellor committed £400 million over four years to venture programmes that aim to leverage £1bn from the private sector. But these investment funds still operate on a small scale, further highlighting the need for the commercial arm of the British Business Bank to mature before we exit the EU.

The British Business Bank must focus on unlocking new forms of capital across the country, and addressing market failures in the UK and Europe. Coadec hopes that Government intervention, in conjunction with a standalone commercial entity, will leverage even greater forms of private capital for tech ecosystems, and reduce the reliance on state-backed funding from the EU and UK.

II. Leaving the EU: The European Regional Development Fund (ERDF)

Recommendation 2: Deregulate EU restrictions on local growth funds and encourage new co-investment funds led by private investors

In this section, we evaluate the role and effectiveness of the European Regional Development Fund (ERDF), and set out a new funding approach that would support startup and scale-up growth across the country. The main fund – the ERDF – exists

to boost research, innovation, new technologies and SMEs across low-output local economies, directed through the Local Economic Partnerships. It falls under the European Structural and Investment Funds, the EU's main funding programme for supporting growth and jobs across the EU.

The £2.9 billion ERDF for 2014-2020 was launched in March 2015 to invest in projects that “support innovation and boost businesses across local economies in England”, to “address persistent disparities in economic performance”, and to “promote entrepreneurship, in particular facilitating the economic exploitation of new ideas¹⁰”.

In 2010, the Coalition Government overhauled the way in which ERDF programmes have been managed in England. Previously, the schemes were poorly overseen by the Government Offices for the Regions and the Regional Development Agencies, with £236 million of financial liabilities.

But the overhauled programme was still required to fit within State Aid rules as set out by the then-Secretary of State, Eric Pickles: “The programme has to operate within the rigid rules set by the European Commission. There are significant financial risks involved in running what are highly complex and bureaucratic European programmes. These can carry large financial penalties for which the Government – and therefore UK taxpayers – always remains financially liable.” As highlighted in our case studies, these rules act as a significant barrier for local startups and scale-ups and must be addressed at the earliest opportunity.

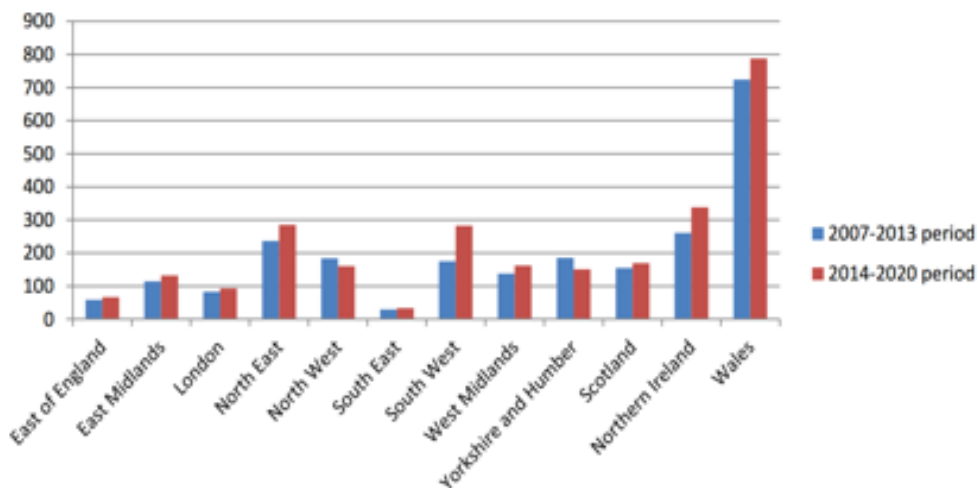
What happens after we leave the EU?

The ERDF is a circular programme. UK taxpayers' money is given to the European Union budget. Under the Fund, a local project receives a contract, spends money and then claims it back from the Department for Communities and Local Government (DCLG). DCLG then claims the funds back from the European Commission.

Post-2020, it will continue to be up to central Government to retain and allocate the funding and decide the structure of the Fund outside EU restrictions. Our opinion is that the Government must commit to the existing levels of funding, and ensure that the devolved areas do not lost out post-Brexit. But also, the Government starts to allocate specific funding for private-led, locally controlled investor funds for startups and scale-ups, with reduced regulatory controls. The original objectives and aims for the ERDF are not aligned with the current process for many founders and investors across the UK, highlighted by the following graphs.

Levels of ERDF funding vs tech investment

Figure 2. Per capita combined ERDF and ESF allocations by region (€)

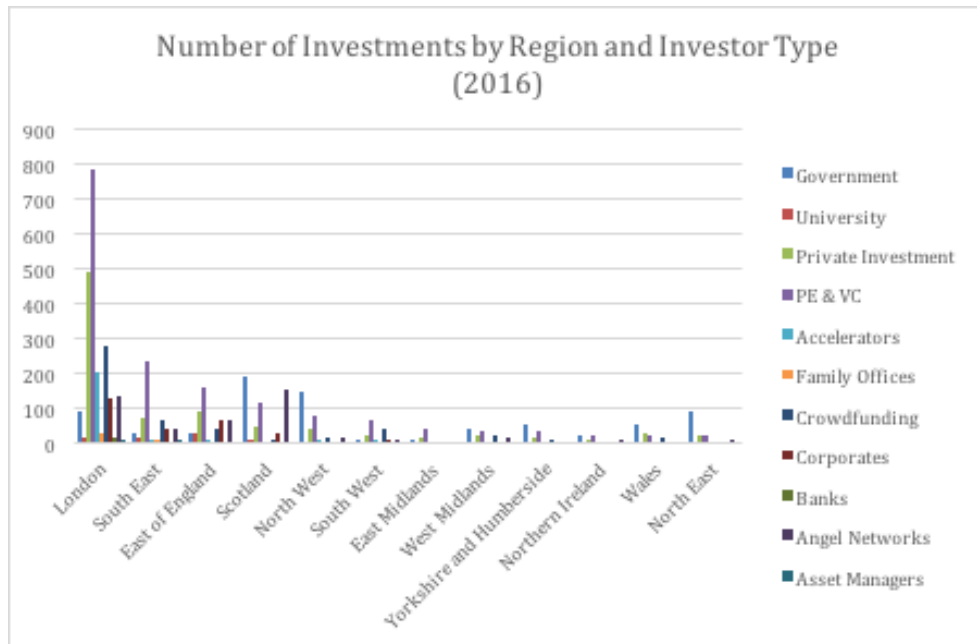


(Source: Sheffield University)

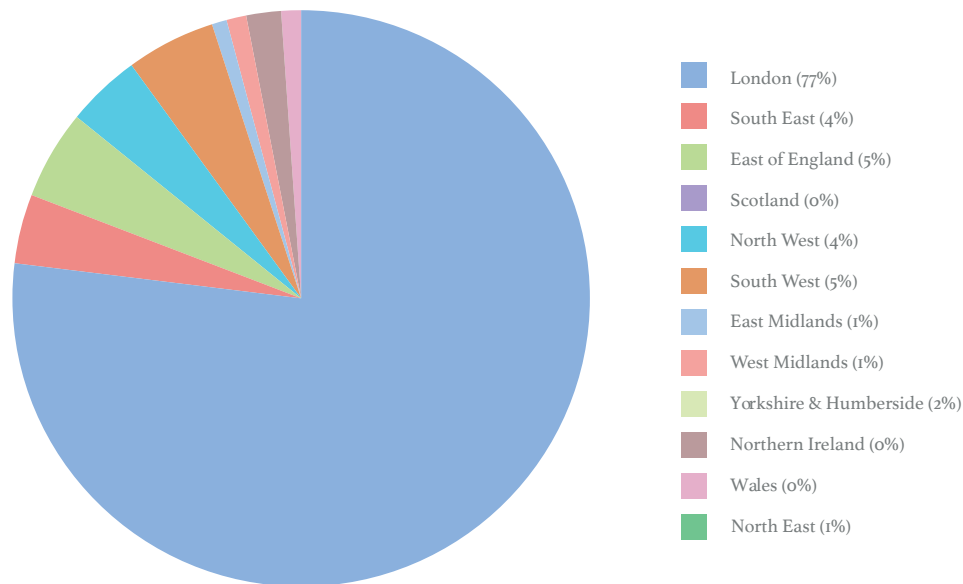
The greatest regional recipients of ERDF funding also have the fewest number of private equity and venture deals (see chart on next page).

Investee Location	Investment Date					
	2011	2012	2013	2014	2015	2016
East Midlands	10	5	7	3	9	9
East of England	24	24	32	33	23	27
London	71	111	113	183	182	164
North East	5	7	4	1	4	3
North West	8	13	15	16	13	15
Northern Ireland	3	3	8	5	8	
Scotland	14	21	28	20	25	19
South East	27	26	41	56	56	37
South West	8	7	9	15	14	13
Wales	4	3	3	8	3	7
West Midlands	3	3	10	6	9	7
Yorkshire and Humberside	1	6	6	10	5	8

This does not come as a surprise, as the ERDF is focused on areas of low economic output. But other investor types are completely absent in these regions.



Accelerator Investments by Region (2016)



The contrast is perhaps most striking for investments by accelerators and incubators. More than three quarters (77 %) of all accelerator investments in 2016 were made in London, while all other regions received a negligible amount of investment.

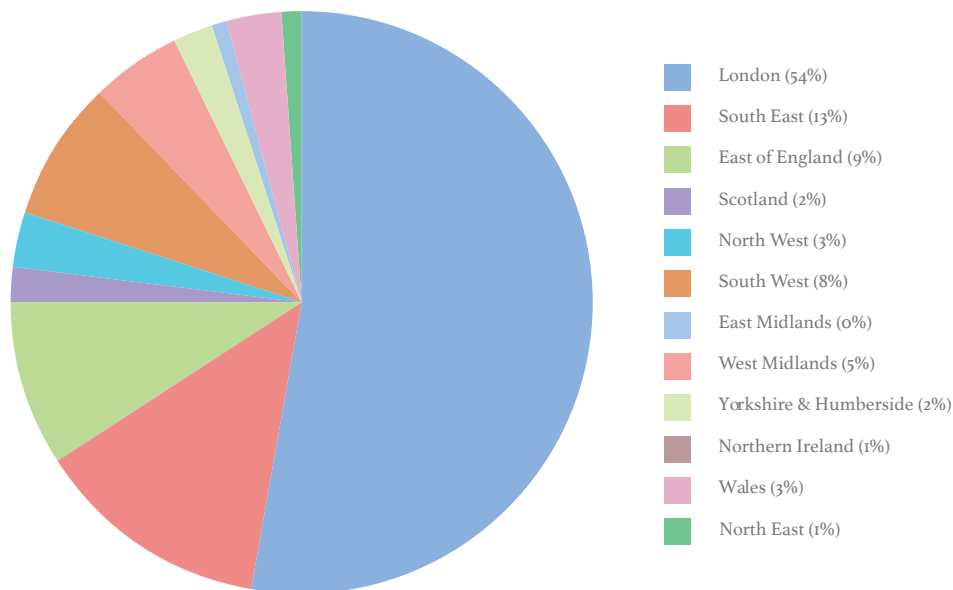
The regional differences are somewhat less stark for crowdfunding investments. London received 59% of all crowdfunding investments in 2016, while the shares for other regions were approximately double compared to accelerator investments.

The data highlights how far all Governments of the UK have to go to unlock stubborn growth patterns across the country, which force founders in the North East or Wales to spend thousands of pounds travelling to London to attract the seed and venture capital to scale their business.

Some simply move to London, taking their ideas, knowledge and ambition with them. Or, worse, give up completely. In turn, regions are failing to attract the necessary private investment to create new accelerators and support founders with the critical advice, mentorship and support at the beginning of their startup journey.

The original intent of the ERDF was not only to reduce economic disparity, but to foster entrepreneurship, support innovation and encourage inwards business investment. For many founders across the country, highlighted in our case studies,

Crowdfunding Investments by Region (2016)



the ERDF has failed due to the excessive rules and procedural requirements. Historically, research shows that despite the innovative output of a society, bureaucracy in the form of excessive rules and procedural requirements, multiple institutions from which approvals are needed and cumbersome documentation requirements, may severely constrain entrepreneurial activity. The time and money required to meet such administrative burdens may also discourage the formation of new venture creations. It's for this reason that the Government needs to keep pushing for hyperlocal growth strategies that effectively address the root causes of why our most promising ecosystems still struggle to make the impact they deserve - despite the talent, knowledge and expertise that exists across the country.

Deregulating existing EU restrictions would be of great benefit to founders looking to attract local investment, as it would put a greater focus on attracting private investment in low-economic regions. The ERDF acts as a co-investor to leverage funds, and it's important that this mechanism continues. But it must be refined, to focus on investments that demonstrate clear economic value to the region. Previously, the European Commission ruled out the involvement of local partners as not compliant with EU regulations. But the advice of local partners is critical when determining funding decisions, to ensure projects are focused on the interests of local communities.

Recommendation 3: Represent the voices of tech founders in the regions and devolved nations:

We travelled the country meeting tech founders for this report. But there also needs to be an online hub for founders to connect across the country, with the advice and expertise they need. For example, a full list of startups, investors, available support and legal experts, which can offer advice online. The Government announced a 'Tech Corridor' in the Autumn Statement, between Milton Keynes and Oxford, supported by improved infrastructure. In the digital age, 'tech corridors' also need to be online, cost-effective networks that help reduce the disconnect that is felt across the country.

We recommend that future local economic growth strategies represent the voices of founders in the regions – including a network of startup and scale-up regional champions, who have direct experience of founding and/or exiting a company. Each champion would have a specific remit to share their local expertise with the Government, and directly with the regions' founders via local institutions, such as Universities or accelerators.

Learning from the past, local economic growth strategies have been too broad in their terms and objectives, and stifled by unnecessary bureaucracy. Going forward, they must align with the specific growth potential and the expertise of a region, continually identifying areas where capital fails to reach talent. This is not 'picking winners,' but backing new and emerging talent.

Examples of UK-wide digital hubs:

- Birmingham (Advanced manufacturing)
- Bristol (Deep tech)
- Cambridge (Deep tech)
- Edinburgh (Fintech)
- Glasgow (Healthtech)
- Hull (Logistics)
- Oxford (Medtech)
- Cardiff (Fintech)
- Leeds (Fintech)
- Liverpool (VR, games)
- London (Fintech, A.I. and machine learning, ecommerce)
- Manchester (Media)
- Sheffield (Advanced manufacturing)

As part of the Government's new Industrial Strategy, we recommend that the Government commit to detailed analyses of areas and sectors of high growth, and the need for targeted interventions (e.g., to support a new accelerator or co-investment fund).

We also recommend earmarking capital for local-led co-investment funds, encouraging a competitive market and the involvement of an increased number of funds. For example, the Northern Powerhouse Fund centralises ERDF capital, across 10 LEPs. But this structure can make it difficult for local funds to compete and direct capital to startups and scale-ups, particularly given the strict eligibility criteria. This model could support the equity gap that exists between £250k and £1m (pre-British Business Bank/VC, but post-Innovate UK/Angels), leveraged by Government funding for successful bids that demonstrate local economic impact.

In addition, we call for tax relief for corporates looking to bring jobs and startup support to disused space. For example, if corporates looking for digital support and innovation took over a vacant building in the city centre and allowed startups to be based there on a short-term rolling contract, they could be in line for a reduced business rate, or placed on the small business rate. Increased university and startup collaboration should also be encouraged as part of new local growth strategies, with funding available to support entrepreneurship programs that have struggled to attract investment and grants.

Case study: Increasing the digital workforce across the UK

An area we believe is ripe for increased support and attention under the Government's Industrial Strategy is the potential of our digital economy. Specifically, the economic impact of digitisation and the positive correlation between digitisation and the economy's productivity and output.

The impact of digitisation on job creation has been a topic of controversy because automation has displaced jobs, particularly in manufacturing. However, the digital economy is the only sector in the EU that consistently added jobs during the economic crisis. Accenture has found that a 10% increase in digitisation is associated with a drop of 0.9% in the unemployment rate¹¹.

In addition, digitisation could improve labour productivity by increasing participation rates and job matching. These estimates are based on innovations that are already spreading in the economy. In reality, GDP gains could be much larger as the digital frontier moves forward at a rapid pace. Surveys by McKinsey¹² suggest that companies that lead in digital usage and workforce perform more strongly, measured by revenue growth and return to shareholders.

11 Accenture. 2014. "Accelerating Europe's Comeback: Digital Opportunities for Competitiveness and Growth."

12 McKinsey Global Institute. 2016. "DIGITAL EUROPE: PUSHING THE FRONTIER, CAPTURING THE BENEFITS."

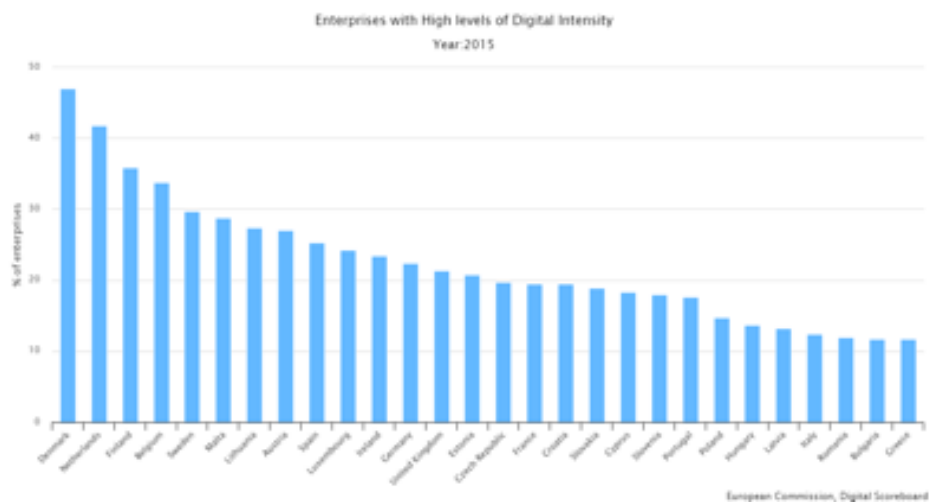
According to McKinsey, the potential productivity gains of digitisation are particularly large in sectors that are asset-heavy, such as manufacturing and logistics; quasi-public such as healthcare and education; or non-tradable such as construction and hospitality. These sectors would particularly benefit from increasing digital usage. Although the UK tech sector is relatively advanced, its development is more reliant on US technology imports than any other European country.

Big data analytics is estimated to contribute an average of £40 billion per year to the UK economy from 2015 to 2020, a cumulative value of £241 billion. Yet the UK scores average among its European peers in terms of digital usage by private enterprises.

National job creation

Notably, the UK has approximately half the digitisation rates of Denmark, which is a digital leader in almost every sector. If the UK achieved parity with Denmark, it would lead to 350,000 more jobs, contributing up to £135 billion in GDP.

There could be up to 1.8% more digital jobs in healthcare (72,000 jobs) and up to 1.3% more digital jobs in both professional services (87,000 jobs) and advanced manufacturing (38,000 jobs).



(Source: European Commission Digital Scoreboard)

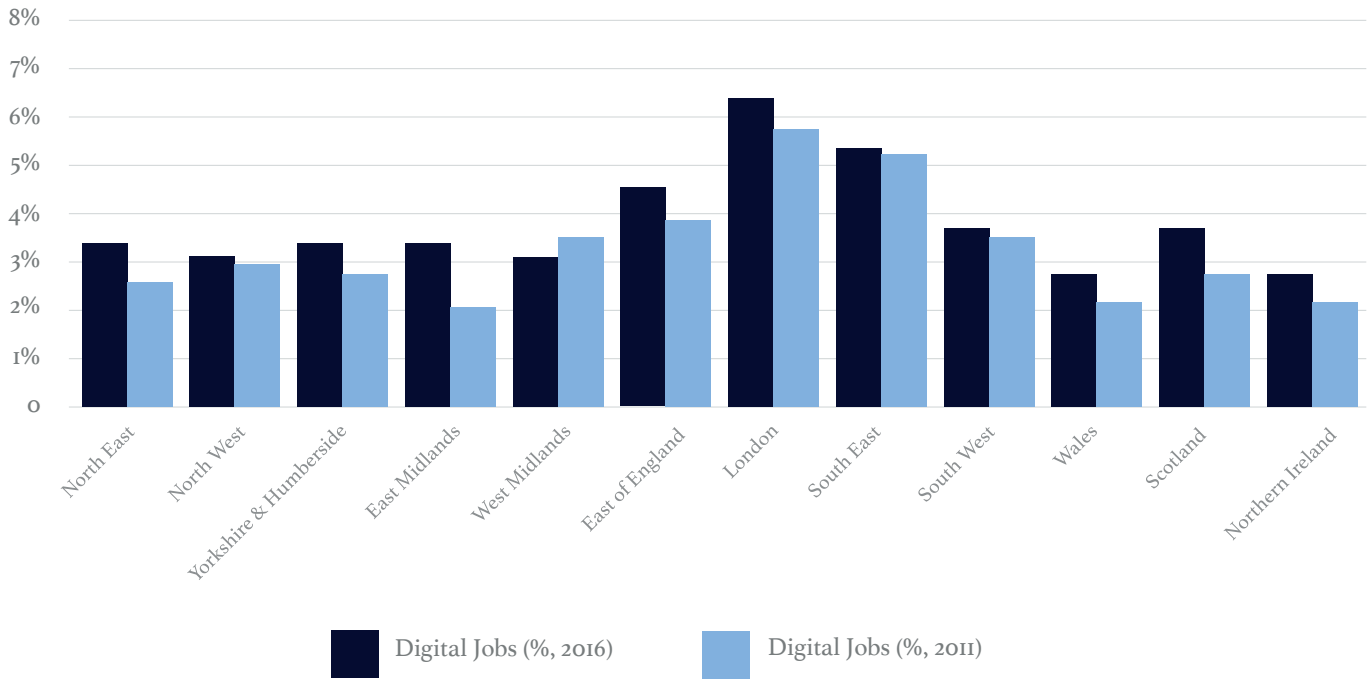
Regional job creation

As explored earlier in this chapter, the Midlands has one of the biggest equity divides in the UK. Compared to the overall strength of UK digital job creation, the West Midlands is also falling behind. Five years ago, there were relatively more jobs in West Midlands than there are today. The North West, Northern Ireland and Wales are also falling behind. When looking at relative gains in digital jobs as a share of all jobs, growth has been fastest in the East Midlands and Scotland, which is encouraging considering their previously low levels of digital jobs.

Yet if penetration levels in the lagging regions caught up with the South East (5.4% in 2016), the UK digital sector could create an additional 495,000 jobs by 2025. The highest gains would be achieved in East Midlands (108,000 jobs) and West Midlands (64,000 jobs). Combined with an effective industrial strategy that fully capitalises and builds on key regional clusters across the UK, the potential of our digital tech businesses is great.

But there is still relatively little data available of digital diffusion rates at the regional level. The UK Government compiles no regional data on the use of digital technologies and services by companies. These indicators are only compiled and published at the national level in Annual Business Surveys (reported to Eurostat). Currently, the best indicator of regional digitisation can be gauged from Labour Force Surveys. We recommend the Government expand regional Annual Business Surveys to ensure that regional policies are as effective as possible, in line with the new the Industrial Digitalisation review led by Juergen Maier, the Chief Executive of Siemens.

Digital Jobs 2011-2016 (% of all jobs in the region)



(Source: Coadec)

Part Four: How else to strengthen the UK tech sector through better investment

Recommendation 1: Allow new venture ‘Funds of Funds’ in public pensions

In this next section, we focus on encouraging more institutional investors to invest in early-stage tech equities, in order to channel more finance to support high-growth startups to scale. We welcome the review into patient capital and R&D credits. But the approach cannot be piecemeal, and must support a joined-up pipeline from pre-seed to late-stage growth, identifying existing cliff-edges and cumbersome bureaucracy that distances modest startups from the capital available.

- Since 2014, Europe has created the same number of startups as the US. Yet because of a lack of available capital to fund the later stages of development, startups are often forced to sell out to US acquirers. European startups also tend to need more funding than the US, due to languages, different laws and currencies.
- The US growth funds dominate later-stage investment. European companies that raise over £10m are funded by US investors 60% of the time. For example, the majority of investor returns in the recent \$1.5 billion exit of Edinburgh-based Skyscanner went to US investors.
- US VCs raise 5.3 times more than European VCs, yet 0.6% of incremental allocation from pension funds would bridge the gap¹³.
- US public pension funds made 936 commitments to PE and VC funds in 2014, for a total value of \$61.3 billion – a 26% increase in number and 47% increase in value from commitments two years earlier¹⁴.

In 1979, a regulatory change allowed pension funds in the US to invest in VC. The rule change, known as the Prudent Man Rule, led to a greater than tenfold increase in the money entrusted to VC funds. Further changes were made in 1980, and resulted in pension funds becoming the largest source of VC funding in the US.

US funds such as the California Public Employees Retirement System and the Teacher Retirement System of Texas have invested billions of dollars in Silicon Valley. The Teacher Retirement System invests \$17.9 billion in PE and receives an annualised ten-year return on investment of 17.8%.¹⁵

Historically, the UK tech sector has not enjoyed the same returns as Silicon Valley counterparts, nor the same funding mechanisms. But this is due in part to the lack of long-term funding, as identified in this chapter, and should be considered as part of a range of solutions to long-term UK tech sector sustainability, as we exit the European Union.

Since the financial crash, whole new generations of venture capitalists and founders have entered the market. But there is a clear need to articulate and progress the argument about why the technology investment market is very different to the pre-crisis market. Post-crash, European venture capital resembles early US West Coast counterparts that went on to become industry titans.

13 Atomico, The State of European Tech 2016 [ibid]

14 Pitchbook, <http://pitchbook.com/news/articles/lp-perspective-us-public-pensions-showing-confidence-in-pe-vc>

15 Public Pension Fund Analysis, December 2015 <http://www.investmentcouncil.org/app/uploads/2015-pension-fund-analysis.pdf>

Having institutional investors such as pension funds return to venture capital may not be a straightforward policy change. But it would greatly enlarge the availability of venture capital in the UK, creating broader and deeper portfolios and greater economies of scale. A larger investor base for UK venture capital would allow startups to grow further up the funding ladder and prevent premature trade sales to overseas buyers.

We believe the decline in investment by UK pension funds in venture capital could be addressed through a tax credit on the dividend income of public pension funds. For example: In a manner similar to the current provisions for private investors, institutional investors might obtain tax relief of up to 30% of their investment in a venture capital trust.

However, unlike private investors, the institutions gain this relief through a tax credit on their other UK dividend income. Thus, for every £1 that an institutional investor in a VCT receives in the form of dividends from UK quoted companies, 10 pence may be claimed back from HMRC, up to a total level in aggregate of 30% of their investment in a VCT.

Recommendation 2: Unlock Local Authority pension funds across all regions of the UK

We recommend the viability of local Government pension schemes investing in venture is considered, to help unlock long-term UK tech sector sustainability and channel more finance into high-growth startups. At the Conservative Party conference in October 2015, Chancellor George Osborne called for the assets of the 89 pension funds in the Local Government Pension Scheme (the LGPS) to be merged into six wealth funds, or “pools”, each containing at least £25 billion of assets.

Some of these schemes are included in the top 100 pension schemes in the UK, when listed by assets under management. For example, the Greater Manchester pension fund has £17.3bn under management. The Local Government Pension Scheme’s 89 funds have combined assets of £214 billion – yet are facing a potential shortfall of £70 billion¹⁶.

The Government believes this pooling of assets will lead to economies of scale and improved ability of the LGPS funds to invest in infrastructure projects, with a proposed date of operation set for April 2018.

¹⁶ Greater Manchester Pension Fund accounts 2015.pdf

To date, the Government has not provided substantive guidance on how the pooling should be achieved, with no primary or secondary legislation to enforce the pooling of assets. Instead, each pool has submitted proposals for Government to consider, motivated by cost savings from investing with economies of scale and a desire for greater infrastructure investment.

The concern is that the pools will only be able to focus on investing at the larger end of the market, when there is the rationale to open up to smaller, investment fund of funds, with the specific remit of investing in and spreading investment across a range of funds that support innovative sectors, such as venture and early-stage technology.

We believe LGPSs should also look to support the growth of digital technology strengths in regional hubs, by providing capital to early-stage investors – both initial seed capital to new businesses, and later-stage funding to allow them to scale. This would achieve the twin aims of tackling regional funding disparities that occur from the concentration of investors in London, and enable pension schemes to gain a greater exposure to the industries of the future. Several LGPSs already invest in regional property funds on the basis of similar principles.

It would be heartening to see devolved administrations undertaking similar policy shifts to unlock stubborn growth patterns.

The insurer-based market

“Leaving the EU provides an opportunity for the UK to assume greater control of insurance regulation. The Treasury Committee is currently looking at the Brexit inheritance on insurance to see what improvements can be made, and any competitive disadvantage it creates when seeking to launch in markets beyond the EU.”

Andrew Tyrie, Chair of the Treasury Select Committee

Insurers are regulated by the EU’s Solvency II capital rules – which require insurers to hold more capital against riskier assets. The capital charges make venture capital investment far too expensive compared to other assets, when investing on behalf of their clients including pension funds.

The risk weighting of each asset class is defined by a Solvency II standard formula that mandates capital requirements, which the industry generally perceives to be

disproportionate to the risk. The basic capital requirement is to ensure 99.5% confidence of surviving an event over 12 months. Insurers are also able to opt for a full or partial internal model for approval by the Prudential Regulatory Authority (PRA), which may better reflect their investment risk profile, but at the cost of increased regulatory risk.

For consideration

The Treasury Committee is currently looking at the Brexit inheritance on insurance to consider whether improvements can be made when the regime is reviewed in 2018. The industry and its regulators have invested over £3 billion implementing Solvency II, so to dismantle it would be of huge disruption and upheaval to the industry. But for firms using the standard Solvency II formula to calculate their solvency capital requirement, the PRA should reassess the standard formula calibration to ensure capital requirements are reflective of the investment risk. For firms using internal models to calculate their solvency capital requirement, the PRA should adopt a risk-based approach to capital requirements – not being overly cautious when assessing asset classes and maintaining a flexible approach.

Recommendation 3: The ‘Scale-up Tech Test’

As an extension of the Government’s Challenger Business Programme, we recommend the Government conduct a major ‘Scale-up Tech Test’ as part of its new modern Industrial Strategy and a routine part of policymaking as we exit the EU.

This would send a strong message to founders: we want to protect what works well. But we also want to ensure the optimum business environment, and remove excessive regulation and bureaucracy. Regulation has a disproportionate effect on startups, which can’t cover the cost of lawyers or take valuable time off to educate policymakers.

Specifically, digital and tech startups have many unique constraints, including time and money, and every action carries a significant opportunity versus risk cost, compared to other sectors. It is important for Government to consider a policy-wide impact assessment when designing both new policy frameworks and procurement rules – and to ensure its policy framework considers the specific needs of tech firms.

The ‘Scale-up Tech Test’ would identify areas where EU restrictions may have added excessive regulation, only exacerbating investment cliff-edges for modest startups.





**Case Studies:
Regional Voices**

CASE STUDIES

MakerClub, Brighton



Simon Riley (right) - co-founder

We struggled to find early-stage investment in Brighton, due to a combination of a small pool of investors, a risk-averse investor profile and a relatively atypical, risky business idea.

Despite having validation from major funding bodies, we still struggled to raise equity funding locally for our round in February 2016 and secure introductions to the right investors. The Sussex Innovation Centre was helpful in organising a pitch day for local investors, but in the end we raised £40k from their personal network and £10k from a local investor. This initial £50k was matched by a £50k loan from Creative England, which has been incredibly supportive since Maker Club won the Creative Business Cup in October 2015.

This funding allowed us to refine our offering and open our first five coding clubs across the UK, in partnership with Barclays Eagle Labs.

Since we struggled to raise funding locally in our first round, we initially looked to London to raise the rest of the £350k for our latest round. Here, we were introduced to Emerge Education, an education accelerator based in Hoxton. After

some negotiation, the round was completed with The FSE Group, a VC backed by Coast to Capital funding, which worked with us to put their proposal to their board.

A well-publicised forum or network of local investors, alongside more funds such as The FSE Group, would be highly beneficial in the Brighton area. It would also be beneficial to have simpler access to very early-stage funding, and further incentives for angels to invest. The FSE Group has a stringent investment process that is hard to satisfy at the early stage.

The funding Maker Club applied for from the Local Enterprise Partnership was offered only as “funding of last resort”, which meant we had to jump through a lot of hoops to fit the criteria. Eventually we were unsuccessful with the funding, even though we were told Maker Club is exactly the sort of thing the LEP likes to fund.

Growth Hacker @ Swapbots & Draw and Code, Liverpool



Annie O'Toole

The most entrepreneurial city in the UK has a major problem: our businesses do not scale, because gaining funding in Liverpool is nearly impossible. With almost no inward investment over the last year, no funds or tech centre housed here, and nowhere to gain access to the investment you need as a startup, scaling becomes nearly impossible.

The Liverpool Mayoral fund does not cater for small investments and it is very difficult to gain access to. The Local Enterprise Partnership needs more support and needs to connect and communicate with the communities it is linked to. Its investment fund may offer a small loan or a startup loan, but there is no way it can compete with the VC funds, angel networks and grants that are available in the South. So, either we lose our talented startups, they migrate down South, or they choke when they're about to get over the line.

In my opinion, the European Regional Development Fund (ERDF) funding has resulted in valueless startup support. Startups that were growing, thriving and employing have missed out on mass investment – investment that would be generating value now, years later. But in Liverpool, we have nowhere else to turn. Our city, the one with the most talented entrepreneurs in the UK, the one that a century ago was crucial to the growth and greatness of our country, is now a place where it's impossible for startups to gain the support and the funding we need. This kink needs to be fixed.

Last year, aged 25, I was voted the number one entrepreneur to look out for, the number one 30 under 30. Today, I am dissolving my company because I had to rely on one high-net-worth individual who is now unable to fund us, after ten months of hard work and due diligence. Down South, a company that scaled at the same pace as we did would have been able to access incubators, accelerators and funding.

We would be stronger if we founded a national, Government-backed accelerator outside London, and ensured that advice on tax relief and legal issues is accessible to startups in every county. If we bridged the gap between North and South, our skills gap would become smaller and our workforce stronger.

Leaf.FM, Newcastle



Gilbert Corrales, co-founder (far right) and the team at Leaf.FM

My co-founders and I relocated from Costa Rica two-and-a-half years ago as part of the UKTI Sirius programme. We were particularly attracted to Newcastle's great quality of living, and what seemed to be a thriving and exciting digital startup ecosystem; a place full of potential for change and innovation.

We didn't have any contacts when we arrived, but Sirius provided us with a £48k grant, sponsorship of our visas and the support of the Ignite 100 accelerator. The opportunity to take part in the Ignite accelerator was the main reason we chose Newcastle. Together with Sirius, it has been critical to our early success.

Two years on, we recently closed our second round of seed funding, attracting £1.7 million investment. But the journey has not been easy. The great majority of money in the UK is in London – and I often have to travel down at very short notice, which means thousands and thousands of pounds spent on travel over the years. The price

is so crippling I often take the overnight bus, attend meetings and get back on the bus again, returning to Newcastle at 1am. Even though this is still cheaper than basing our company in London, what chance does a small startup have of covering these costs while growing a business on a tight budget?

In hindsight, it would have been a huge help to have free travel included in the Sirius programme. Or a local grant to cover a subsidised annual rail season ticket for local business people looking to scale in the region.

Another concern is that the Ignite programme, which used to be run from Newcastle, has had to relocate to London and Manchester during the last 12 months, due to better access to funding in those cities. Ignite was a catalyst for exciting things happening in Newcastle, where it's not uncommon to walk past ten empty buildings in the town centre. While I celebrate Ignite's expansion to other cities, I'm also saddened that the region has not seen a full programme being run here over the past year.

Another area we struggle with is finding the right office space, due to lack of flexible tenancy terms. Landlords typically require a five-year lease and a large deposit, which is impossible if you're a fast-growing startup and will outgrow the space within a year.

If corporates looking for digital support and innovation took over a vacant building and allowed startups to be based there on a short-term rolling contract, that would be a huge help. Space within university campuses would also be great for startups for a number of reasons. For example: cost-effectiveness and direct access to a perpetually refreshing pool of potential employees and interns.

The region is home to three fantastic universities – one Ivy League – but you don't feel there's direct engagement between startups and the knowledge hubs of the universities. Stronger local links would be a major positive step in the right direction, in terms of mentorship and collaboration.

Things are progressing slowly with initiatives and organisations such as Creative Fuse, Dynamo, Sunderland Software City and Newcastle Council's recent appointment of a Director for Tech Strategy, who is starting to engage the universities in earnest. Campus North keeps pushing strongly as the ambassador for startups in the region, but there's still a long way to go.

Fusebox Games, London



The FuseBox Management Team

Like all startups, we are always on the lookout for help to get our business off the ground. There are many useful services and incentives out there, but we have found that access can be problematic, slow and expensive.

As a video games business, our investors should be able to benefit from both Seed Enterprise Investment Scheme (SEIS) and Enterprise Investment Scheme (EIS) tax relief on their investments. But the paperwork is time-consuming and expensive for a startup, requiring specialist advisors to ensure that investment documentation will clear HMRC pre-approval. These advisors can be very expensive and the costs tend to come pre-funding, when a business has very little money.

We are also eligible for Video Games Tax Relief and have access to various grant schemes, including Creative Europe. However, the red tape involved with these claims can be daunting for a small startup like ours. It is often tempting to outsource claims to specialist accountancy or other advisory firms, since small startups do not have the time or in-house capabilities to make these applications for grants, which can become a full time job. Many of these firms offer a “success only” fee, but this can be up to 20% of the value of the claim, significantly diluting the value of the support.

Nudjed, Cardiff



Warren Fauvel, founder, Nudjed

We combine behavioural psychology with technology to improve health services, and though raising money has been tough, the situation is improving, with an increasing number of Welsh startups securing seed capital. One of the new challenges facing us, is the ability to take some of these companies to scale.

In Wales, public sector spending makes up ~60% of total GDP, compared to ~43% UK wide (2014/15). In silicon valley, Google, Facebook and the like, buy from, partner with and acquire SMEs, in their quest to innovate. The story cannot be the same for Government bodies. With such a large part of the Welsh economy “public”, startups can sometimes struggle to find scalable customers here. Even if these organisations have massive, urgent challenges. Culture, bureaucracy and procurement can sink the most sensible deals.

One of the projects we’re exploring with NHS Wales looks to tackle this challenge. We call it the Zealous Healthcare Ecosystem. The project uses a fraction of Wales’ £7.4bn healthcare budget to create a self-sustaining digital ecosystem. Providing early sales traction for SME’s helping to secure private sector investment, whilst returning royalties from international sales, to fund future innovation. All whilst solving problems that the NHS has identified as valuable.

Though Wales is probably not the first place people think of for health technology innovation. Our large, devolved public sector, diverse socio-demographics and growing health challenges, makes for a compelling opportunity. One that Nudjed is keen to nurture.

Funding Case-Studies

I. New Investment Model to support digital startups

“The UK has huge potential as a technology leader. However in order to realise this potential we need to support digital technology businesses at each stage of the lifecycle, and right across the UK, to increase the number of scale-ups and the success rate of digital technology businesses. ADV’s goal is help these aims by investing patient, evergreen capital where it is needed across the country.”

(Lee Strafford, ADV Ventures)

Accelerated Digital Ventures (ADV) launched in November 2016 with an initial £150m of capital to address the geographical and equity disparity in the deployment of capital into businesses across the UK.

ADV has a unique structural approach: founded as an investment company (versus a fund) it brings together long term institutional investors to invest capital which is patient (focused on asset value not exit value) and evergreen (where the capital stays in the system); with an operational team with extensive business building experience who to deploy the funding.

ADV can also make direct investments into ‘venture’ or scale-up stage business; and growth or later stage businesses, and will invest in incubators, accelerators and microfunds.

ADV’s current investors are the British Business Bank, Legal & General and Woodford Investment Management - combining public sector finance (investing on commercial terms) and private sector financing to inject a new capital source into the digital ecosystem. ADV invests throughout the UK (including regions and cities across the UK, including London) via its distributed team in place in clusters across the UK, including Edinburgh, Glasgow, Newcastle, Bristol, London, Cambridge, Oxford and Manchester.

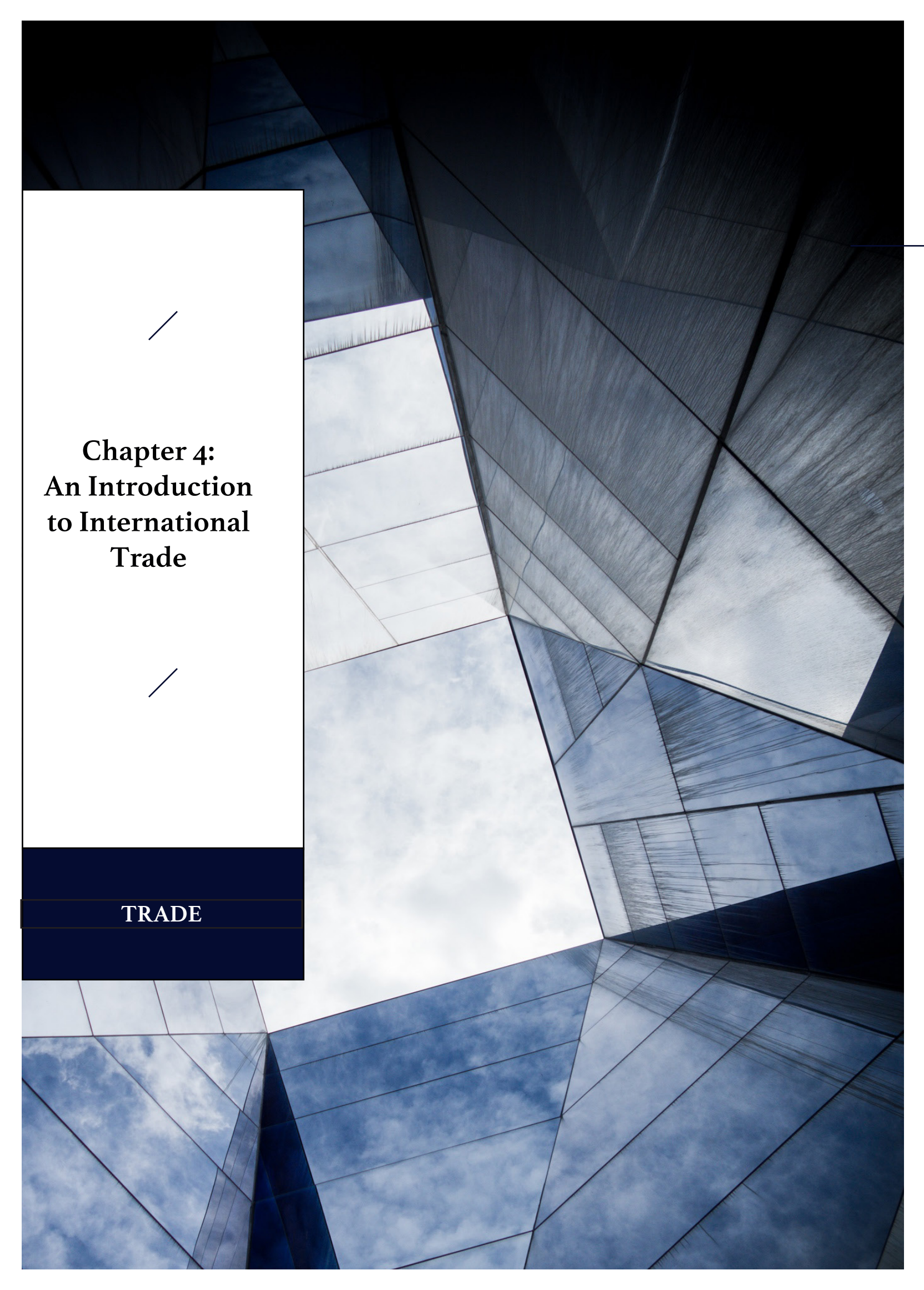
II. New Fund to support female founders

“AllBright exists because we want to make sure that the UK is the best place in the world to be a female founder. But the fact is that women across the country are not being backed by capital and often don’t have the support network to advise on

investment and growing a business. But we cannot do it alone. As we exit the EU, it's vital that the government backs and supports new forms of entrepreneurial talent and growth across the country. This not only makes good socio-economic sense for the country. But will help boost our global standing as one of the best places in the world to set up a business.”

(Debbie Woskow OBE, co-founder, AllBright)

Debbie Woskow and Anna Jones co-founded AllBright to invest in and support female founders across the country. At present, a woman in the US is twice as likely to start a business as a woman in the UK and only 7% of venture capital investors are women. AllBright aims to change this, as women on average deliver 35% better returns than men, and female entrepreneurship is a significantly under-tapped resource in the UK. If all the women in the UK who say that want to start a business did so, it would add an extra £10billion to the UK economy (Facebook She Means Business Report 2015).



Chapter 4:
An Introduction
to International
Trade

TRADE

I. Introduction

PRIME Minister Theresa May's assurances¹ that the United Kingdom will seek a relationship with the EU that allows us to negotiate our own international trade agreements is a clear sign that the current bloc trade negotiating strategy is not viewed as being in the long term best interests of the United Kingdom, and that a more global-facing approach is actively being pursued by the Government.

There are, however, agreements that have been reached at EU level, the UK departure from which could be detrimental to both industry leaders and consumers in the digital services sector if handled poorly.

The EU has led the way in breaking down barriers within the member state bloc, such as the 2009 Telecoms Framework Directive², which paved the way for relaxing, and eventual abolition of roaming charges within the EU, matters which have yet to be resolved at WTO level. However, it should be noted that issues such as roaming charges are increasingly being addressed in other trading bloc areas around the world, trading blocs, which crucially do not preclude member states from forging external bilateral trading partnerships.

Historically there have been diverse opinions across EU member states in relation to the bloc's approach to international trade. The UK has been, at times, underserved by mandatory bloc trade negotiations; for example, in how we approach Commonwealth partners who often share the fundamental structures and protections of our common legal system, and in approaching the United States with whom we are more closely aligned on business attitudes and culture.

These moves towards placing the UK on a more global footing necessitate increased engagement by the digital and technological sectors with Government to ensure their needs are met – both in terms of our future relationship with the EU, and in our future attitudes and policies towards global trade. This chapter represents some initial thoughts on what those interests might be, and how the Government should begin to approach them on the world stage.

¹ <https://www.gov.uk/Government/speeches/the-Governments-negotiating-objectives-for-exiting-the-eu-pm-speech>

² <https://ec.europa.eu/digital-single-market/sites/digital-agenda/files/Copy%20of%20Regulatory%20Framework%20for%20Electronic%20Communications%202013%20NO%20CROPS.pdf>

2. The UK's Current Position

The digital economy represents 14.5% of all UK service exports³, worth £30bn per annum. With a strong track record of support for digital startups and connectivity, the UK Government is a solid partner to the digital and technological industries. This, coupled with a historically liberal business environment, is at odds with some (although crucially not all) of our European partners, with the UK acting as a liberalising voice on European policymaking. The bloc as a whole cannot be said to have a uniform approach in this area and the Digital Single Market, while making progress, still faces significant barriers of its own.

It is not just the UK, which is benefitting from the digital revolution, the entire concept of trade has been upended in recent years with the increase of digital and data flows around the world. With such rapid change in the digital world, the European Union is struggling to keep up. The lack of agreement across the membership bloc as to what form a future digital single market should take, and diverse opinions from nations with an historically different economic approach to the United Kingdom, have resulted in stagnation in this area, despite the will towards agreement shown by the current EU Commission. It remains unlikely that France, the United Kingdom and Germany would have reached common ground on regulatory standardization, and examples such as differing approaches to disruptive technologies such as Uber only serve to prove this point.

Whilst movement has been made towards renegotiating the Customs Union agreement with Turkey to include the digital sector (which was crucially missed off the original agreement of some twenty years ago), progress is likely to be as slow in this area as movement on the digital single market has been.

Such revolutions in the digital sector benefit not only the smaller (and indeed startup) enterprises of the world, but also smaller communities and nations. In this environment, it can be argued that the “bloc” mentality of the EU has been holding back global digital trade advancement for its member states. This, in turn, will result not only in delays to agreements with nations such as Singapore (crucially from the UK's perspective, Singapore is a similarly service sector based economy) but also in opportunities for startups to scale up across the continent as a whole. Whilst the UK's departure from the EU will not solve this problem in the immediate term, it may help to solidify the UK's position with the EU in terms of regulatory symbiosis.

³ DCMS Digital Sector Economic Estimates 2016 <https://www.gov.uk/Government/publications/digital-sector-economic-estimates-january-2016/digital-sector-economic-estimates-2016-key-findings>

Whether viewed through the prism of electronic commerce, digital goods and services or data flows, trade provisions for these areas are covered off in trade negotiations as part of a wider package including all economic sectors and elements, from agriculture to chemical manufacturing.

The largest deal of this nature to be struck, the Comprehensive and Economic Trade Agreement (CETA) between the EU and Canada took seven years of negotiation. Yet the sections in relation to, for example, “trust and confidence” in electronic commerce are not in any way revolutionary, and indeed bind both parties to adhering to rules laid down by the multilateral organisations to which they are both members and signatories.

ARTICLE 16.4 Trust and confidence in electronic commerce

“Each Party should adopt or maintain laws, regulations or administrative measures for the protection of personal information of users engaged in electronic commerce and, when doing so, shall take into due consideration international standards of data protection of relevant international organisations of which both Parties are a member⁴”.

It can be surmised that a bilateral negotiation process would be easier to conclude, on the grounds that the digital sector in the United Kingdom would be free of any potential constraints placed on an EU wide, multi sector trade deal by, for example, the Danish porcine agricultural industry. Constraints which may not be shared by their equivalent UK sector, but which will hold up a negotiation nonetheless.

This move towards an ability to exercise a bilateral approach to UK trade is timely for another significant reason: namely, the move away from multilateral agreements signaled by President Trump. By cancelling the United States’ involvement in the Trans Pacific Partnership (TPP), the President provided the latest in a long line of reasons why the Transatlantic Trade and Investment Partnership (TTIP) is unlikely to succeed, at least in its current form. Both TPP and draft TTIP provisions do provide, however, a solid benchmark for where the UK should aim to succeed in future UK/US bilateral trade agreements.

It is not, however, only in the area of bilateral trade where the UK digital sector has been poorly served thus far. The EU member state bloc negotiating strategy extends to multilateral organisation talks and negotiations, principally through the WTO, which has prevented, to a certain extent, the UK taking a leading role in pushing its own interests in agreements such as TISA.

⁴ <http://data.consilium.europa.eu/doc/document/ST-10973-2016-INIT/en/pdf> p240 Article 16.4 Trust and Confidence in Electronic Commerce

3. The Future: The World Trade Organisation and the Digital Sector

In the UK's approach to global trade in digital goods and services, it is crucial that we focus not just on our approach to country by country bilateral agreements, but also on improving our independent relationships with existing 'partnership' blocs such as the Commonwealth, the ASEAN nations and the East African Community (EAC).

The UK has a limited track record of formal interaction as a member state in our own right within the World Trade Organisation. However, the UK is a founding signatory nation to the Marrakech agreement of 1994, which established the WTO, and we hold our own seat. A breakdown of the UK Government's current membership arrangements and future membership plans was published recently by Julian Braithwaite, the UK's Ambassador and Permanent Representative to the UN and other International Organisations in Geneva⁵, in which he laid out our position on separating from the EU within the WTO:

“Establishing the UK's separate position in the WTO is not simply a matter of starting to speak up for the UK from one day to the next. Every WTO member state has things called schedules, lists which set out their commitments – their rights and obligations – in the international trading system. These cover trade in both goods and services. WTO legal experts will tell you that, as a full member, the UK already has its own schedules. But at the moment these are shared with the other EU Member States.

“Smoothly separating the UK from the EU schedules is the best way we can reassure our WTO partners that their trade with us will not be disrupted as we leave the EU. Once we have our own schedules in the WTO, the UK will be able to negotiate changes to the international trading system as well, whether multilaterally (with the whole membership of the WTO) or plurilaterally (with some of it).

“A country's WTO schedules also provide the baseline for negotiating bilateral Free Trade Agreements. There is a process in the WTO that allows the UK to submit new schedules. But they can only be adopted – or certified – and thus replace our existing EU schedules if none of the WTO's other 163 members object to them. So to minimise any grounds for objection, we plan to replicate our existing trade regime as far as possible in our new schedules. Before we take any formal steps in the WTO, we will hold extensive informal consultations with the WTO membership. Every member will have an opportunity to raise any issues or concerns with us before we proceed.”

⁵ <https://blogs.fc.gov.uk/julianbraithwaite/2017/01/23/ensuring-a-smooth-transition-in-the-wto-as-we-leave-the-eu/>

This position from the Foreign and Commonwealth Office/Department for International Trade should go some way towards assuaging industry fears relating to our immediate future within the international trade market. It should also give an indication of lines the EU will not be able to cross in relation to our future bilateral relationship with the bloc, since they would be in breach of WTO rules were they to inflict punitive tariffing or regulatory measures over and above the WTO mandatory maximums.

The importance of the UK's future trade relationship with the United States cannot be overstated. With the abolition of the Trans Pacific Partnership, a number of very good policy precedents have also been abolished, most notably the introduction of binding language in relation to cross-border data flows, a change in the previous US negotiating position, which was designed to limit the ability of nations to restrict information flows (with exceptions in the realms of 'public morals', national security and matters concerning privacy).

Since the United States was also at the vanguard of encouraging similar language in the Transatlantic Trade and Investment Partnership (TTIP) and the Trade in services Agreement (TISA) it can be presumed that the change in administration will also herald a change in policy position in these multilateral agreements. However, the United Kingdom is to be viewed, and should be positioned by the UK Government, as a more reliable bilateral partner than could be guaranteed under multilateral agreements. As such, this move towards binding language should be encouraged in any future bilateral trading relationship to make sure that progress in this area is not lost with the change in administration.

4. Secrecy and Civil Society Engagement

One ongoing criticism of the trade negotiation process, across all sectors and at both bilateral and multilateral level, is a perceived aura of secrecy around negotiations. The digital sector must initiate early engagement with the UK Government and any counterparts in the United States to ensure that the fundamental freedoms of the digital sphere, which appear and are maintained almost without design through the nature of digital innovation, are not infringed upon or overlooked by negotiating parties.

This engagement is especially important in the digital sector, since the sector is fairly poorly understood at Government level the world over. The sector should be willing to challenge negatively impacting trade negotiations through the Amicus Curiae system of dispute resolution at the WTO. Although the filing of such briefs does not necessitate that they be considered, the court of public opinion weighs heavily here and negative press surrounding a lack of consideration would be easy to generate.

Alerting the UK Government to potential problems will hopefully remove the need for the digital sector to enter into the WTO⁶ dispute process itself, but increased knowledge and awareness of the processes available should be a priority in case intervention is needed. That being said, with the UK Government's focus on supporting the digital sector (as evidenced in their commitment to regular digital sector strategy papers), it is unlikely that any trade deal which negatively impacted the sector would be signed off because of the potential for large scale, public objections from a sector that is no stranger to openly challenging Government policy in public fora.

The E15 Initiative "Data Moving Across Borders: The Future of Digital Trade Policy" paper from April 2016, written by Amy Porges and Alice Enders⁷, outlines in some detail policy goals which can provide a solid framework for where the UK should position itself on global digital trade policy. Central to everything is a commitment to the free flow of data, with adequate protections (a position on which is outlined in the next section) alongside a rejection of any move towards increased of punitive tariffing at WTO level, which the UK will now be in a position to fight against on its own behalf for the first time.

5. The UK's Data Protection regime

Trust in the UK's data protection and cyber security regimes are critical to the success of startups, both in the UK and as they scale internationally.

The General Data Protection Regulation (GDPR)

On 1st February 2017, the Digital and Culture Minister, Matt Hancock confirmed that the UK Government expects to "opt in" to the EU's General Data Protection Regulation (GDPR).

The GDPR is the first major legislative change to European Data Protection law since the mid-1990s. It affects almost all organisations doing business in the EU – even those located outside the EU – as it creates tighter limits on the processing of personal data, and gives greater rights to individuals.

The GDPR is intended to harmonise data security, retention and governance legislation across EU member states. It requires greater oversight of where and how sensitive data – including personal, credit card, banking and health information – is stored and transferred, and how access to it is policed and audited by organisations.

The law was criticised for being too strict, but any other approach would threaten the lawful transfer of data between the UK and EU member states, potentially disrupting business and our digital economy.

⁶ https://www.wto.org/english/tratop_e/dispu_e/disp_settlement_cbt_e/c9s3p1_e.htm

⁷ <http://e15initiative.org/publications/data-moving-across-borders-the-future-of-digital-trade-policy/>

Government Priority

After Brexit, the status of GDPR in the UK is less clear. GDPR adoption is necessary. But it won't guarantee an adequacy decision – which determines that a third country has an adequate data protection regime, and therefore European personal data can be processed there. The UK will be classified as a 'third country', and will need to secure an 'adequacy decision' from the European Commission to facilitate lawful data transfer with EU member states.

Without an adequacy decision before we exit the EU, companies would need to put complex legal clauses in their contracts or term of service and may need to have these sanctioned by an EU DPA.

The Government must secure an adequacy decision from the European Commission to enable UK startups to process EU personal data, without incurring expensive legal costs. Trust in the UK's data protection and cyber security regimes is critical to the success of startups, both in the UK and as they scale internationally.

The EU and the US

In August 2016, the EU and US introduced a new agreement known as the Privacy Shield, to ensure European personal data can be legally processed in the US. The Government will need to explore what additional agreements with the US will be necessary.

What this means for digital startups

Research drawn from the Global Databerg Report by Veritas Technologies indicated that 54% of organisations are yet to begin any work on meeting minimum General Data Protection Regulation (GDPR) compliance. Any Brexit-related confusion will inevitably disrupt the work of businesses involved in data storage and transfer to the EU.

The principal new burden on startups will be the requirement for firms to appoint a Data Protection Officer (DPO) if they handle large amounts of sensitive data or regularly gather data on customers – a provision that takes in most tech startups.

The DPO must have expert knowledge of data protection law and practices. Low turnover startups could struggle to finance this obligation in what will quickly become a highly competitive market for skilled data protection officers. However, member states have the option of expanding the requirements for a DPO.

The other significant change under GDPR is that data controllers and processors will become jointly liable for any breach of the regulation. Joint liability will extend responsibility beyond the companies that collect and use personal data, to include cloud-providers, data centres and processors for data held on their services.

Since data processors will have little oversight over whether the data collected by data controllers is compliant with the regulation, managing the legal implications of this requirement within contracts between controllers and processors will be difficult and potentially costly.

This means that customers, particularly SMEs, will face higher costs. The UK data protection authority will need to work closely with industry to develop best-practice model contracts to help make compliance with joint liability requirements as easy as possible for startups.

While the Information Commissioner's Office (ICO), supports equivalent regulations, having stated that the GDPR will have to be applied "if the UK wants to trade with the single market on equal terms", the solution may not be straightforward.

The UK Government accepted during the High Court hearing in *Miller v Secretary of State* [2016] EWHC 2768 (Admin) that some EU laws, such as laws enabling UK courts to refer questions to the Court of Justice, could not be transposed in domestic law. Similarly, where laws depend on cooperation between EU member states or institutions – including those related to mutual recognition and enforcement of judgments – the UK cannot legislate to continue or to replicate those existing arrangements.

As Kenneth Armstrong, Professor of European Law at the University of Cambridge, observed: "Such a legal device could not, of course, create obligations for other EU States towards the UK; that can only be achieved by whatever withdrawal and subsequent agreements might be negotiated."

Institutional cooperation lies at the heart of the GDPR. It establishes a new European Data Protection Board (the Board) to replace the Article 29 Working Party. The Board is a legal entity and has specific responsibility for the GDPR's "consistency mechanism", designed to ensure smooth and effective cooperation and consistency between national data protection regulators within the EU. Membership, understandably, is limited to EU Member States.

A light-touch alternative?

Britain could take an alternative, more business-friendly path with less oversight. Liberal laws on data protection could encourage investment in areas such as artificial intelligence, an area that has a complex relationship with privacy and in which Britain excels, as shown by the many acquisitions of homegrown A.I. businesses.

The Culture, Media and Sport Committee, meanwhile, has suggested that the UK could introduce its own system of pay curbs for executives at companies that fail to protect their customers' data – potentially a more effective incentive than the sanctions regime laid out in GDPR.

However, free flow of data requires recognised and agreed standards for privacy, security and data formats. The prospect of a regulatory chasm opening up between Britain and the EU on data is not a risk worth taking.

6. EU Competition and the End of Freedom of Movement

London has been a natural hub for innovators from across the EU thanks to liberal and, for the most part, non-punitive domestic economic policies; a moderate to highly skilled workforce; and a global native language. With the end of EU freedom of movement, at least under its current guise, digital centres of excellence across the rest of the EU will clamour to attract business away from London and the UK as a whole. It is therefore important that:

- a) The rights of EU workers currently employed in the UK are assured as we exit the European Union.

And, as we have explored in Chapter Two:

- b) There is a new approach to visas for highly skilled workers in the digital and tech sectors.

A long-held belief has existed within the UK that the freedom of movement requirements from the EU have prevented the country from introducing a wider range of visa and immigration options for citizens of the Commonwealth. It is true to say that nothing in the EU currently prevents the UK from introducing more liberal policies for Commonwealth citizens. But with an overall drive towards lowering – but not eliminating – current immigration levels, such liberalising policies are politically untenable while freedom of movement within the EU still exists.

7. Recommendations

The UK's departure from the European Union presents opportunities to the digital sector. But in order for these opportunities to be realised, the sector must take action in the following areas:

1. Engaging with the Department for International Trade and the Department for Exiting the European Union on matters relating to data movement and tariffs, through strong centrally organised trade bodies. This is important to ensure there is no gap in the relationship with the EU on matters relating to data flows and regulatory requirements. It is equally vital that any agreement with the EU on our departure does not negatively impact our ability to negotiate with the United States. Above all, the UK digital sector must not be forced into a position of having to choose between European and US engagement.
2. Engaging with digital industrial strategy to ensure the future stability of the sector within the UK. This is particularly important in light of the inevitable withdrawal from central European funding systems, as outlined in the previous investment chapter. The onus will be on the UK Government to ensure the right market circumstances are created domestically to enable startups to scale up when the time is right. The sector must engage to make sure provisions currently in place at EU level are not missed out of post-EU domestic policy planning in the UK.
3. Adopting solid positions on overseas worker requirements to inform the digital sector's input to the Government's Brexit negotiations.
4. Engaging with the Brexit negotiations in areas where the EU has underserved the digital sector in the past, in order to avoid being caught in unnecessary red tape or undesirable policy positions when our new relationship with the EU is defined.
5. To work constructively with the new US administration to ensure progress made on binary versus non-binary language in trade agreements is not lost in any future bilateral US/UK trade deal.
6. Increasing the industry understanding of WTO negotiating practices and avenues for dispute resolution, to create an early warning system for potential trade negotiation conflicts. Trade bodies should consider grouping together on these issues to run policy workshops for the sector.

In order to assuage fears within the digital sector, the UK Government must take action in the following area:

1. Recognising the failings in central Government's understanding of matters relating to the digital sector, and increasing the opportunities for sector secondments to the Department for International Trade (DIT) to advise on both national policy and in-market trade opportunities. The DIT will have to wholesale reassess its overseas staffing through the FCO diplomatic missions, and should consider asking for industry secondments to create digital sector trade specialist positions in our diplomatic missions overseas.
2. Create regular open forums for discussion between the digital sector, senior legal specialists from the private sector and the UK Government to avoid unnecessary disagreements through a lack of understanding on both sides
3. Increase spending on and improve policy in relation to lifelong digital learning, in consultation with the digital sector, to mitigate any skills shortfall from the end of the freedom of movement from the EU.

Glossary



Accelerator: Accelerator networks (angels, venture capitalists) support startups by providing mentorship, hands-on experience, space and often financing in return for founder shares or an equity stake.

Artificial Intelligence: Artificial Intelligence (AI) is broadly defined as the science of making computers do things that require intelligence when done by humans.

Computer science: The study of the principles and use of computers, focused on foundations of computing including, algorithms, programming languages, theories of computing, artificial intelligence, and hardware design.

Digital Economy: The transformation or digitisation (the ‘fourth industrial revolution’) of the economy by the digital sectors.

Fund of funds: A mutual fund that invests in other mutual funds, rather than investing directly in stocks, bonds or other securities.

High-growth tech firms: For the purpose of this report, high-growth is defined as digital and tech firms that have received equity investment [Beahurst definition].

Growth stage: 5+ years, generating substantial revenues and likely some profit [Beahurst definition].

Programmer (coder): A programmer knows how to code and may have the technical skills needed to build meaningful products (but definition not interchangeable with software engineer/developer).

Seed stage: The first official round of financing for an early-stage startup. Low valuation and funding received. Investment used for initial product development and/or proof of concept [Beahurst definition].

Software engineer/developer: A developer or engineer focuses on technical and managerial leadership for large and complex systems. Its foundation of enduring engineering principles will support a lifetime of practice amid emerging technologies.

Scale-up: The OECD defines a ‘scale-up’ as an enterprise with average annualised growth in employees or turnover greater than 20 per cent per annum over a three year period, and with more than 10 employees at the beginning of the observation period.

Tier 2 visas: The Tier 2 visa is the main UK immigration route for skilled workers coming to the UK to take up employment, usually paying a salary of at least £20,800. In order to apply for this visa, workers must have a job offer and a certificate of sponsorship from a UK employer with a valid Tier 2 sponsorship licence.

Venture stage: 3+ years. Funding likely to come from venture capital firms. Funding received and valuation both in the millions [Beahurst definition].

Venture capital: Funding provided by venture capital firms to startup companies considered to have strong growth potential. Typically to finance startup early market development and growth. Funding is often provided in stages.

Report co-authors



Romilly Dennys is the Executive Director of Coadec and provides policy advice and Government relations support to a UK-wide coalition of startups and scale-ups.

In preparation for this report, Romilly travelled the country meeting founders and hearing first-hand about the challenges they face when scaling their company.

She is a former UK Government Special Adviser.

@romillydennys



Lauren McEvatt is the Managing Director of Morpeth Consulting Limited, an integrated public policy, Government relations and strategic communications consultancy providing support to both private and public sector clients across multiple policy areas.

She has previously consulted on international trade policy for an East African Government, and is a former UK Government Special Adviser to David Jones MP, in his former role as Secretary of State for Wales.

@LaurenMaeve



Rachel Wolf is Director of Public First, an organisation that specialises in public policy, public opinion, and campaigns. She is the former education and innovation adviser to the Prime Minister. She was founder and Director of education charity New Schools Network, and was Senior Vice President of education technology company Amplify.

@racheljanewolf

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We would love to get your feedback on the report and further areas you'd like Coadec to look at. Please email: romilly.dennys@coadec.com

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The Coalition for a Digital Economy

“It’s vital that the Government backs and supports new forms of entrepreneurial talent and growth across the country, so I’m very pleased to see Coadec take this important agenda forward in this report. Their policy work is of enormous value to the UK-wide startup and scale-up community.”

Debbie Woskow OBE, Chairman, AllBright, CEO, Love Home Swap

“This report goes a long way to understanding and maintaining the environment from which great British tech startups will emerge. The depth of analysis offers a guide to both industry and Government presenting evidence and rationale for recommendations so that home-grown startups are given the best possible chance of success. By covering education, immigration, funding regulation, and more, in great detail this report offers a rounded, thorough analysis, which warrants attention.”

Tom Tugendhat MP

“Coadec makes a compelling case for the Government to get behind UK-wide high growth startups and scale-ups. These firms are already having a transformational impact on the UK. But we need more of them across our regions and cities to ensure that prosperity reaches all corners of the UK.”

Sherry Coutu CBE, Chair, Founders4Schools, Non-Executive Director, Zoopla and the London Stock Exchange Group, Advisory Board of LinkedIn.com

“Coadec’s report spells out clear, realistic measures to help with the challenges entrepreneurs face when building a company. I hope the Government listens.”

Taavet Hinrikus, co-founder, TransferWise

“The UK is faced with a unique opportunity to become a world-class hub for technology startups and it’s crucial we do everything we can to support the best entrepreneurial talent in this country. We welcome this timely report.”

Samir Desai, CEO and co-founder of Funding Circle



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