The Economic Impact of Huawei in the UK

June 2015

HUAWEI

OXFORD ECONOMICS

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Executive Summary

Huawei, a Fortune Global 500 company, is a leading provider of global information and communications technology solutions. It is the world's second-largest manufacturer of telecoms network equipment and one of the world's most innovative companies. Since opening its first office in the UK in 2001, Huawei has been investing here, stating that the country offers one of the most open and welcoming economies in the world, with a more straightforward regulatory environment than other countries. As a company Huawei has played an active part in rolling out high-speed broadband across the UK, developing 4G and 5G, and recruiting a skilled UK workforce in the ICT, digital and high tech industries.

Huawei has publicly committed to spending £1.3 billion in the UK. Huawei is on track to meet this spending commitment, making it one of China's largest inward investors in the UK.

Huawei has publicly committed to spending £1.3 billion in the UK. The company made this commitment in September 2012, when it announced its intention to spend £1.3 billion (US$2 billion) in the UK over the five years from 2013-2017, split equally between procurement and investment. This report assesses whether Huawei is on track to meet these targets. It does so by analysing the economic impact that the company's activities had on the UK economy in the years 2012-2014. It explores a range of quantifiable and less easily measurable channels and analyses these impacts in the context of the £1.3 billion public commitment.

Huawei is on track to meet this spending commitment, making it one of China's largest inward investors in the UK. If the levels of activity undertaken in 2014 were merely maintained, then over the five years 2013-2017 procurement alone would total £1.02 billion, and the total for investment and procurement combined would reach £1.41 billion.

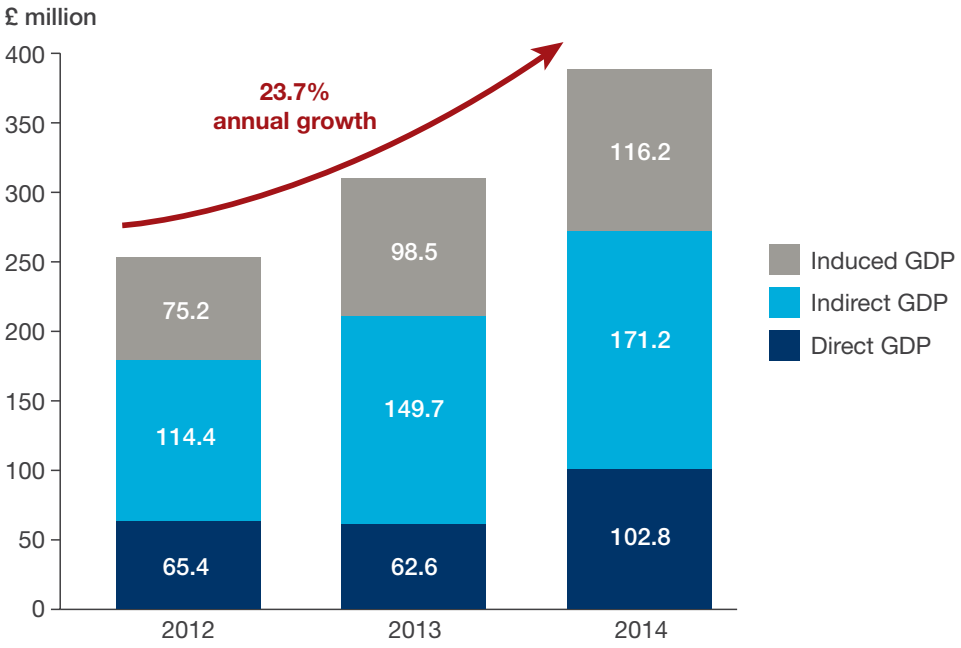
Huawei's UK investment and procurement spending

£ million	2012	2013	2014	Commitment for 2013-2017	Total 2013-2017 if 2014 level maintained
Total of investment and procurement	178.3	226.9	295.1	1,300	1,407

The story is similar for investment, which in Huawei's case mainly comprises Research & Development (R&D). This spending started from a low base but increased substantially between 2012 and 2014. If the recent rate of growth, excluding the impact of 'one-off' events, is maintained, then total investment over 2013-2017 would reach £811 million, thereby also meeting the £650 million commitment.

The economic impact of Huawei on the UK economy extends beyond its procurement and investment expenditure. It can be measured in terms of contribution to GDP, its role in developing UK infrastructure such as high-speed broadband or 4G, as well as the company's contribution to UK employment and government tax revenues. In the three years 2012-2014 Huawei's total contribution to UK GDP was £955.9 million, comprising Huawei's direct (own) contribution of £230.8 million, an indirect (supply chain) contribution of £435.3 million and an induced (employee spending) contribution of £289.8 million. Between 2012 and 2014 this total GDP contribution grew at an average annual rate of 23.7 per cent.

Huawei's total contribution to UK GDP, 2012-2014



Source: Oxford Economics

By 2014 Huawei supported 7,400 jobs in the UK economy, across the three channels of impact. For every person employed directly by Huawei in the UK in that year, a further six UK-based jobs were supported by supply chain linkages and employee spending. Over the three years combined, the total contribution to GDP was also sufficient to generate £411.4 million in tax revenues for the UK Exchequer. In 2014 alone these tax revenues, at £161.9 million, would have been enough to cover the wages of over 5,000 full-time nurses.

Huawei in the UK has become a highly productive business. Looking at Huawei's own activities specifically, in 2014 its labour productivity – its GDP per employee – was £99,800, compared to the UK average of £43,800.

Huawei's contribution to the UK economy, 2012-14

£ million	Total 2012-2014	2012	2013	2014	Annual growth rate
Direct GDP	230.8	65.4	62.6	102.8	25.4%
Indirect GDP	435.3	114.4	149.7	171.2	22.3%
Induced GDP	289.8	75.2	98.5	116.2	24.3%
Total GDP contribution	955.9	255.0	310.8	390.1	23.7%
Headcount		**2012**	**2013**	**2014**	**Annual growth rate**
Direct jobs		781	916	1,030	14.8%
Indirect jobs		2,539	3,181	3,724	21.1%
Induced jobs		1,759	2,255	2,632	22.3%
Total jobs contribution		5,079	6,352	7,386	20.6%
£ million	**Total 2012-2014**	**2012**	**2013**	**2014**	**Annual growth rate**
Direct tax revenues	128.6	39.6	38.8	50.3	12.7%
Indirect tax revenues	125.7	33.1	43.6	49.0	21.5%
Induced tax revenues	157.1	41.4	53.0	62.7	23.1%
Total tax contribution	411.4	114.1	135.4	161.9	19.1%

Source: Oxford Economics; Huawei

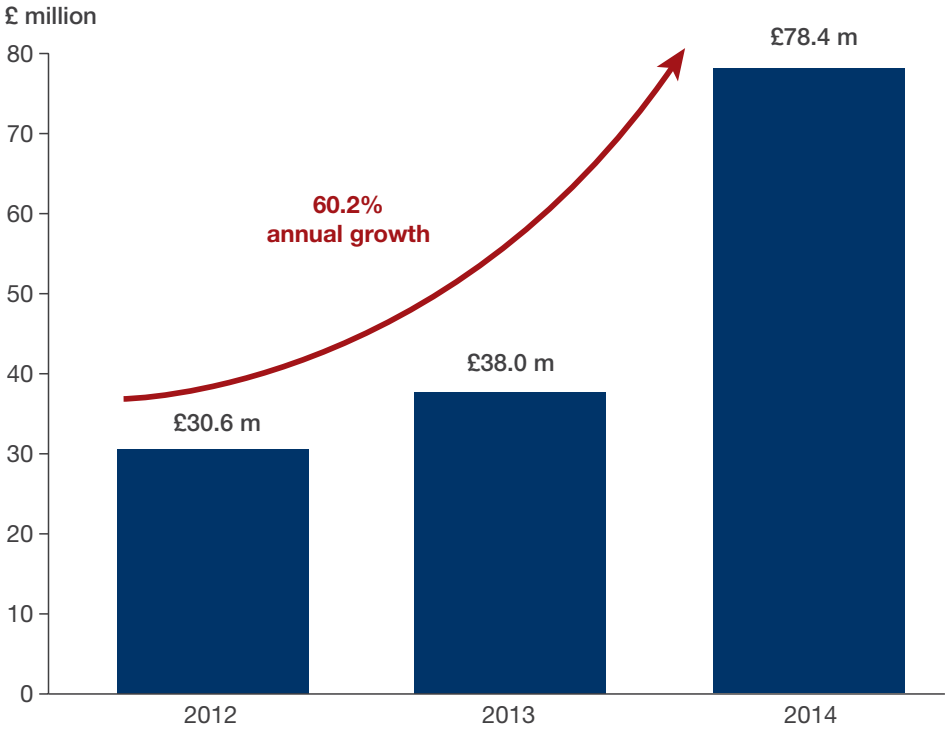
Huawei's economic impact is spread throughout the UK. The company now has a presence in 15 locations across the UK. In the period 2012-2014 it sourced goods and services from suppliers based in 86 of the UK's 121 postcode areas. As a result the contribution it makes to GDP and employment has a positive impact on all of the UK's regions. The largest contributions are found in the South East and East of England, followed by London, but in 2014 the company's activities also supported over 300 jobs in each of the South West, Yorkshire and the Humber, and North West regions.

Huawei is contributing to R&D and innovation in the UK. Huawei's R&D spending grew from £30.6 million in 2012 to £78.4 million in 2014 – an average annual increase of 60.2% – helped among other things by the expansion of the Ipswich-based Centre for Integrated Photonics (CIP), acquired in 2012, and the acquisition of the Cambridge-based company Neul in 2014. Huawei has set a target of almost doubling its R&D workforce from 156 currently to 300 by 2017.

The company has established a strong and growing set of R&D activities, under the banner of the Huawei UK Innovation Programme. This programme has included opening a new R&D centre in Bristol, focused on researching ICT chips, and investing £10 million in joint project work with leading British universities, such as the University of Surrey's 5G Innovation Centre, where 5G technologies are being pioneered. Huawei also operates two joint innovation centres in the UK, where it collaborates on research with BT and Vodafone.

Looking in more detail at Huawei's R&D spending we can identify additional or 'spillover' benefits from its activities. Huawei's R&D activity will add to its own revenues in future by increasing the value of its final outputs. But, importantly, the benefits will also be felt by other companies across the UK (The benefits of R&D activity have been shown by academic studies to go well beyond 'private' returns). Other UK-based businesses are likely to gain, as partnerships, supply chain linkages and employee mobility allow knowledge and technological advances to spread. This would generate what Huawei calls a "win-win" effect for the UK economy at large.

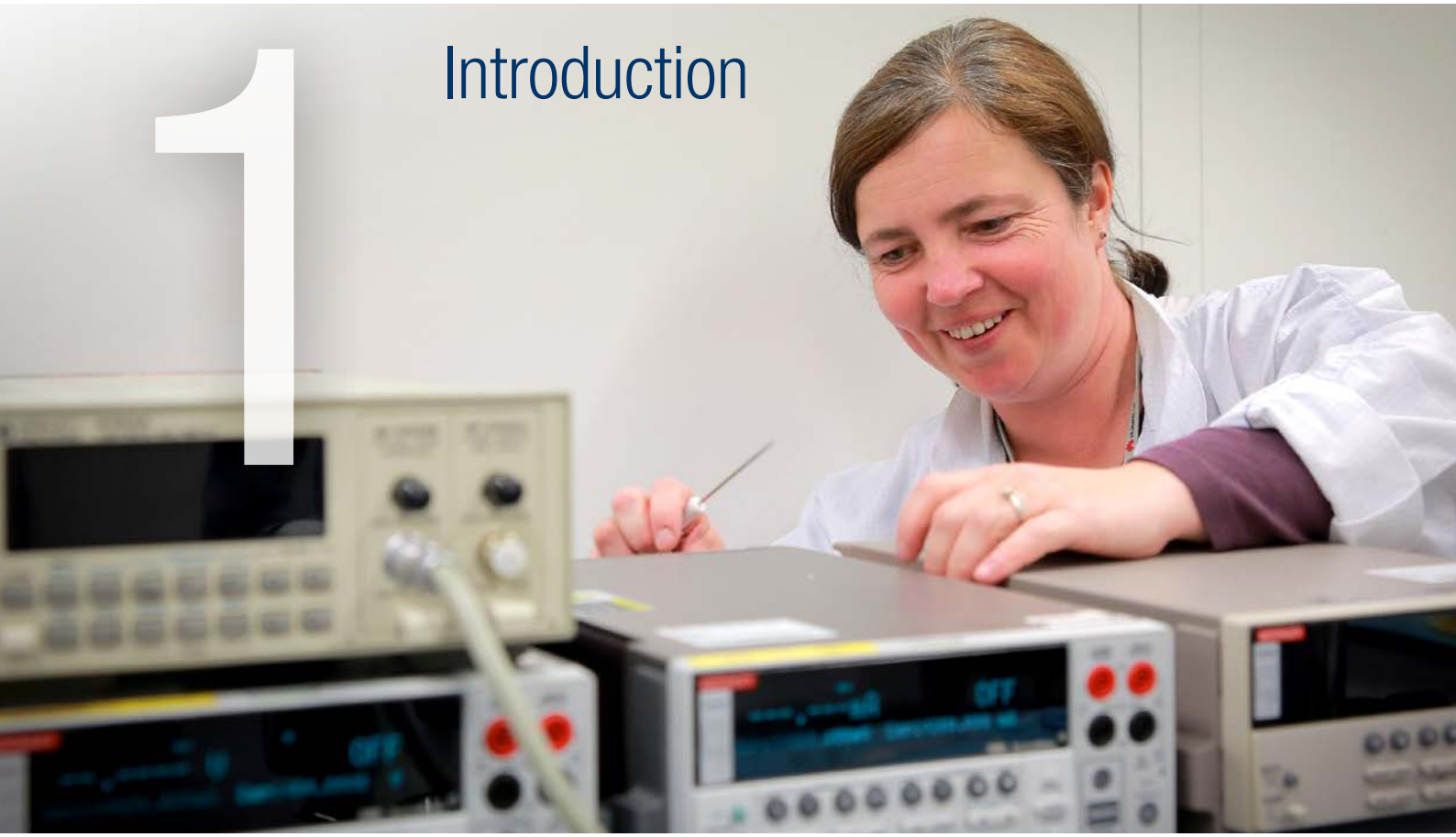
UK-based R&D activity undertaken by Huawei, 2012-2014



Source: Huawei

Oxford Economics estimates that, if Huawei's 2014 level of R&D activity were merely maintained, UK GDP would eventually benefit by a further £310 million per annum, on top of the £170 million annual return earned by Huawei itself. Much of this so-called 'spillover' benefit could be expected to be felt, at least initially, by firms and institutions local to Huawei's project work.

Huawei's activities have other positive impacts for the UK. These include, for example, the benefits that arise for UK consumers, as illustrated by its partnerships with customers in the UK. This report looks at two of these partnerships in more detail, namely those with EE and Openreach on the rollout of 4G mobile telephone infrastructure and superfast broadband infrastructure respectively. In addition, Huawei's aims align with some of the UK Government's key goals in economic, trade and technology policy. The company also has a strong commitment to corporate social responsibility.



1 Introduction

This report quantifies the economic contribution to the UK economy of ICT company Huawei in the years 2012-2014. It also benchmarks that performance against the company's commitment to spend £1.3 billion on procurement and investment in the UK over the five-year period 2013-2017, and analyses other aspects of its contribution to the UK's economic and social wellbeing.

1.1 About Huawei

Huawei is a leading multinational information and communications technology solutions provider and a Fortune Global 500 company. It opened its first office in the UK in 2001 and won its first major UK contract, with BT, in 2005. In the decade since it has grown from a telecoms provider to a fully integrated ICT supplier, and has helped roll out parts of the UK's broadband and telecoms networks.

Huawei's partnership with BT remains an ongoing one, presently focused on the provision of Superfast Broadband, and, in addition, the company is involved in partnerships with other household names, including EE's 4G roll-out and Vodafone's 'Project Spring'. Employing over 1,000 people in the UK, its UK headquarters are in Reading, one of 15 Huawei workplaces situated around the UK.

Globally, Huawei is headquartered in Shenzhen, China. It employs 170,000 individuals around the world, 76,000 of whom are engaged in R&D-focused work, and its products can be found in over 170 countries, serving more than a third of the world's population. It has three core operating divisions: the Carrier Network, Enterprise and Consumer business groups.

As one of China's largest inward investors in the UK, Huawei plays an important role in investing in the next generation of computer scientists and engineers, their skills and research and development in the UK. This is demonstrated through the company's support of undergraduates, through partnership projects with the University of Cambridge, Imperial College London and the University of Surrey, and through investing in technology research programmes with other British universities.

The company describes its vision as being "to build a better connected world and enrich life through communication".

1.2 Report structure

The report is structured as follows:

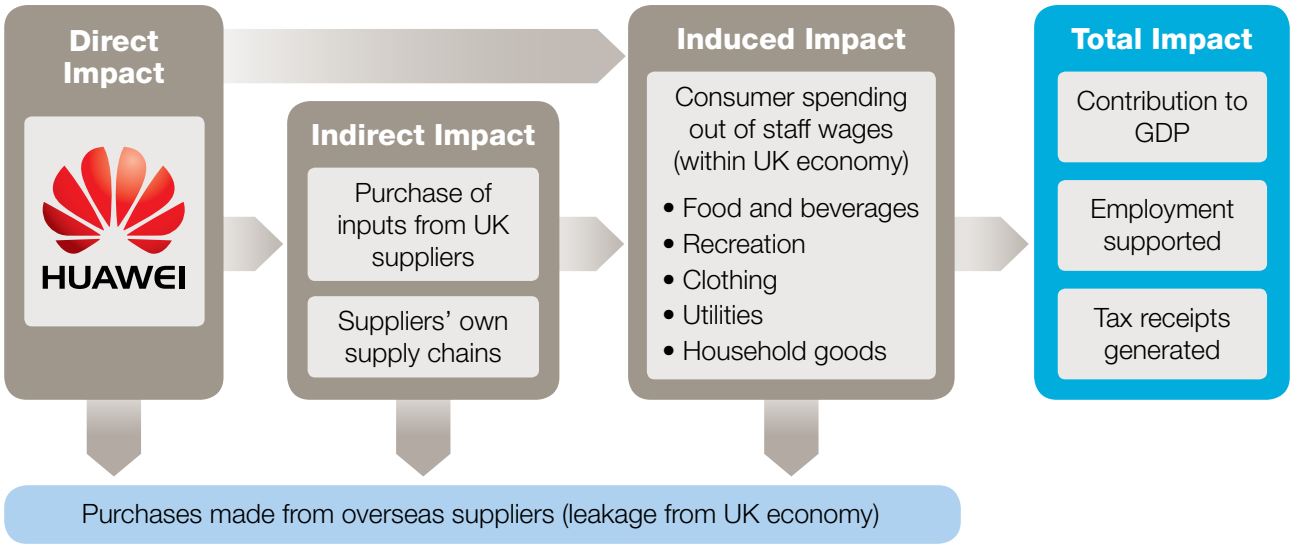
- An **introduction** to economic impact analysis is included in the remainder of this chapter.
- **Chapter 2** explores Huawei's core economic contribution to the UK economy in 2012, 2013 and 2014, i.e. the contribution through its own activities, its purchases of inputs from UK suppliers and the payment of wages which stimulates consumer spending. It also breaks that contribution down by region.
- **Chapter 3** examines Huawei's performance further in the light of the £1.3 billion five-year UK procurement and investment commitment, including a more detailed analysis of its R&D activities and a study of the role of the Huawei Global Finance Centre.
- **Chapter 4** assesses Huawei's wider contribution to the UK economy, looking in turn at: its role in advancing technology to benefit UK consumers, including through its partnerships with EE and Openreach; the benefit to the wider UK economy of its UK-based R&D work; and other channels of impact including in the field of corporate social responsibility.
- An **annex** sets out the methodology underlying the calculation of the economic impact.

1.3 Methodology and sources

The first task of this report is to undertake a standard economic impact analysis to identify the three core channels of impact that stem from the activities of Huawei in the UK, which are characterised in Figure 1.1:

- The first is the direct effect of the activities of Huawei itself.
- The second is the indirect effect which encapsulates the activity supported in Huawei's UK supply chain as a result of its purchases of inputs of goods and services.
- The third captures the impact of staff spending their wages on UK-produced goods and services, both those working for Huawei and those employed in its supply chain. This creates economic activity at the retail and leisure outlets that they visit, and throughout these establishments' supply chains. This is known as the induced effect.

Figure 1.1: The core channels of economic impact



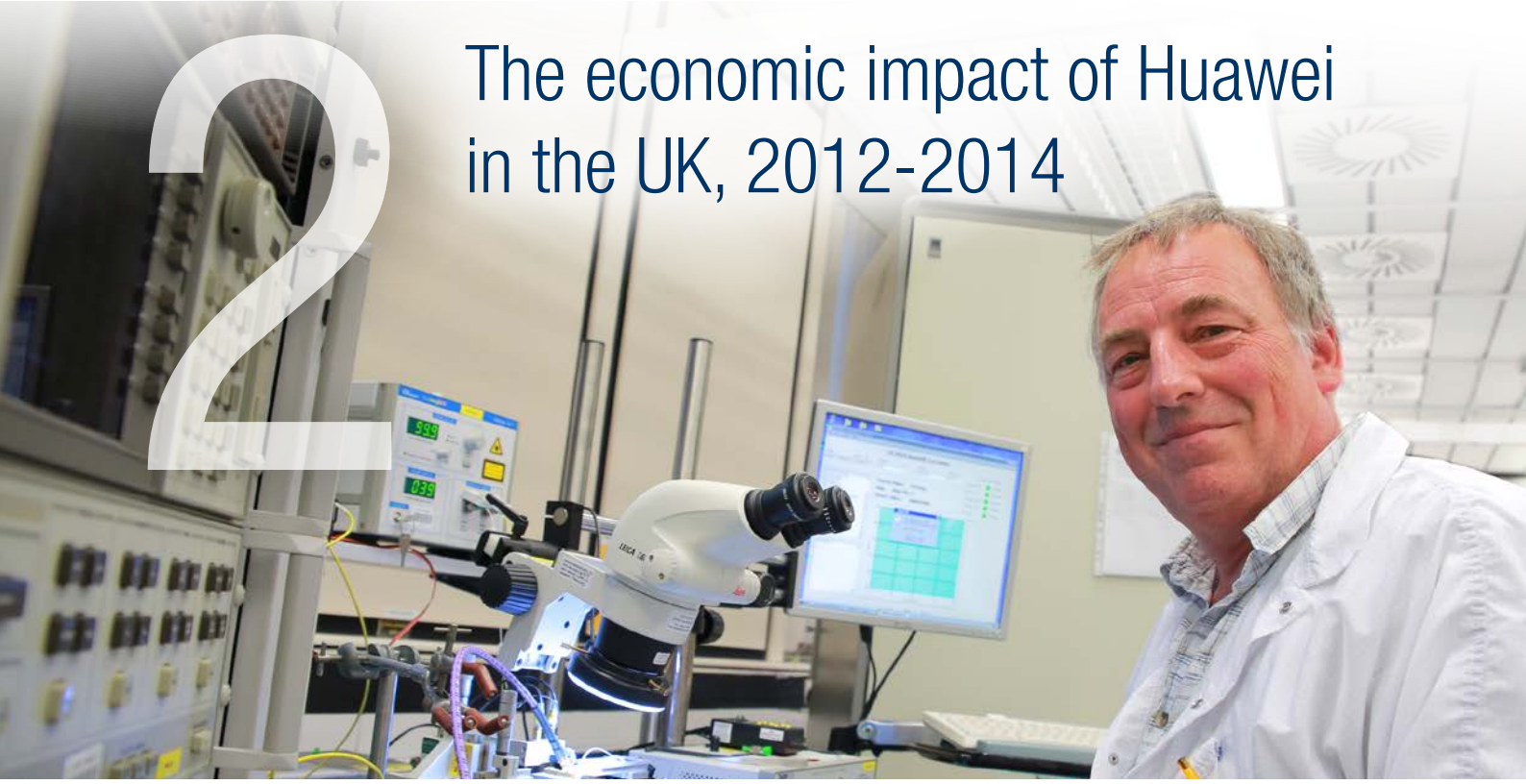
In accordance with standard economic impact assessments, the scale of the impact of the business is measured using three key metrics:

- The contribution to the economy's **gross domestic product (GDP)**, i.e. the value of goods and services produced.[1]
- **Employment** – measured in terms of headcount and embracing all 'workforce jobs', i.e. including self-employed as well as employee posts.
- **Taxation** – covering tax revenue streams of all kinds generated for the UK Exchequer.

The contributions were worked out by combining financial and employment data supplied by Huawei, consistent where relevant with financial data supplied by the company to Companies House, with a range of official datasets concerned with patterns of output, income, expenditure and transactions across the UK economy. The Annex explains the Economic Impact Assessment methodology in detail as well as listing the specific data sources.

1 A company's contribution to GDP is calculated as the difference between the value of its turnover and its payments to other businesses for raw materials, non-capital goods and services. This will be equal to the sum of other business operating costs (mainly staff costs) and gross profits. In standard economic assessments such as this, gross domestic product is measured at 'basic prices', i.e. net of taxes on sales such as VAT. This measure, which is also known as 'gross value added', is typically a little lower than the 'headline' measure of GDP, which is valued at 'market prices' – i.e. including sales taxes.

HUAWEI
To celebrate the opening
of the new Huawei Headquarters in
11th June 2013



2 The economic impact of Huawei in the UK, 2012-2014

This chapter quantifies the contribution of Huawei to UK gross domestic product (GDP), employment and tax revenues, in 2012, 2013 and 2014, through the direct, indirect and induced channels.

Huawei's direct contribution to UK gross domestic product totalled £230.8 million over the three year period 2012-2014, and grew by 25.4% per annum in that time.

2.1 Direct effects arising from Huawei's activities in the UK

Demonstrating Huawei's commitment to the UK, the direct contribution of the company to UK GDP totalled £230.8 million over the three year period 2012-2014, and grew at an average annual rate of 25.4% between 2012 and 2014 – a strong growth curve. As a result, the number of individuals employed directly by Huawei in the UK increased by 14.8% per annum, to reach 1,030. Further details are shown in Table 2.1 and Chart 2.1[2].

Table 2.1: The direct contribution of Huawei to UK GDP and jobs

£ million	Total 2012-2014	2012	2013	2014	Annual growth rate
Total direct GDP contribution	230.8	65.4	62.6	102.8	25.4%
Of which: costs (mainly staff costs)	203.1	55.2	66.4	81.5	21.5%
gross profits	27.7	10.2	-3.8	21.3	44.5%
Headcount		**2012**	**2013**	**2014**	**Annual growth rate**
Total direct employment		781	916	1,030	14.8%

Source: Oxford Economics; Huawei

2 The direct GDP contribution is calculated by summing up over the cost elements included in GDP – wages, employers' national insurance and pension contributions, and taxes on production – and profits before tax, interest and depreciation ('EBITDA' in company accounts).

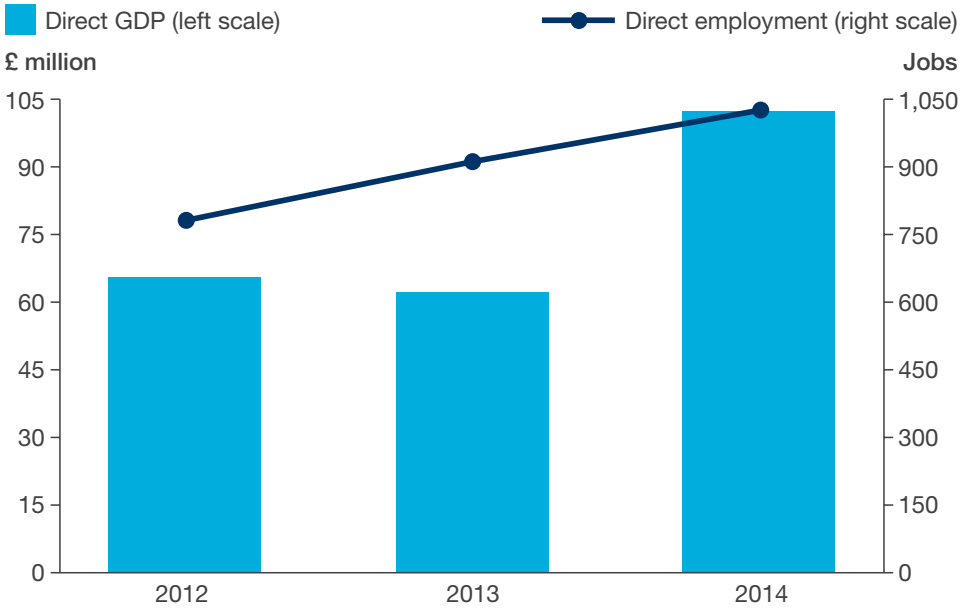
These figures include the activities of R&D establishments CIP and Neul, acquired in 2012 and 2014 respectively, as well as Huawei's more longstanding UK-based operations.

With 1,030 staff in 2014, Huawei's GDP per employee works out at £99,800 compared to the UK average of £43,800.

Looking at 2014 in isolation, GDP per employee – labour productivity – works out at approximately £99,800, compared to the UK average of some £43,800[3] (Chart 2.2). This is likely to be due to the high-skilled and technical nature of much of Huawei's work in the UK.

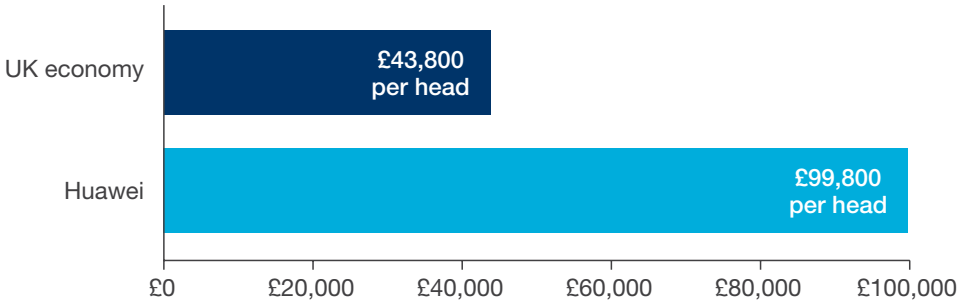
It is worth noting here that Huawei has a policy of recruiting locally. Before 2014 it achieved a 70% local recruitment target in the UK. This was stepped up to 75% in that year.

Chart 2.1: Huawei's direct contribution to GDP and employment



Source: Huawei, Oxford Economics

Chart 2.2: GDP per employee (labour productivity) in 2014



Source: Huawei, Oxford Economics

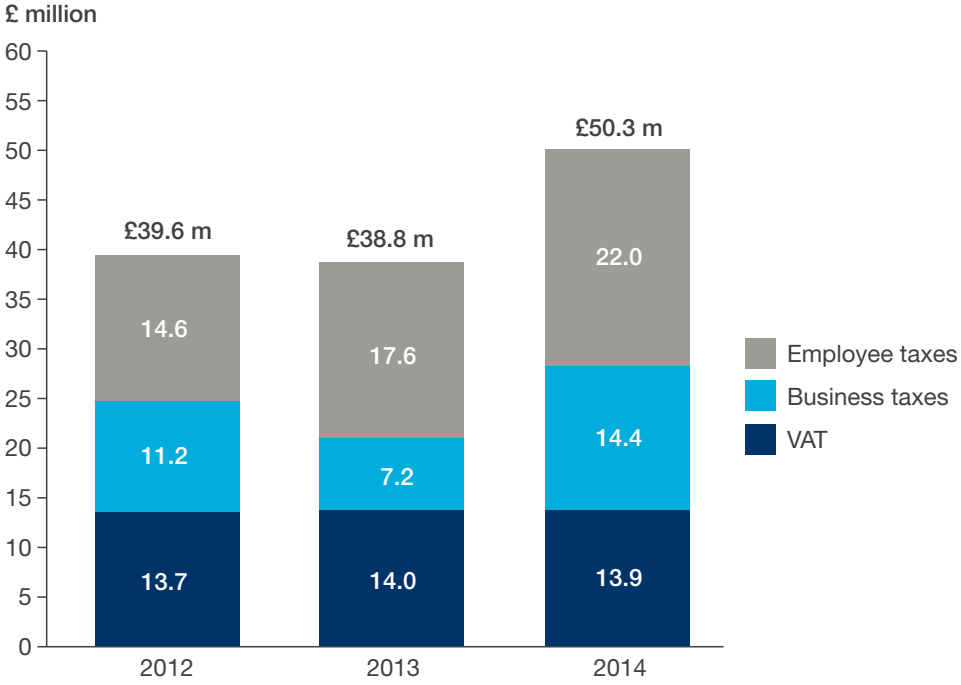
3 The UK figure is for GDP at basic prices excluding imputed owner-occupied rent, per workforce job.

2.1.1 Direct tax contribution

Over the three years, Huawei's direct tax contribution totalled £128.6 million. This sum grew by 12.7% per annum between 2012 and 2014. Details are shown in Chart 2.3.[4]

The direct tax contribution of Huawei and its staff amounted to 49% of GDP in 2014, compared to the UK-wide ratio of around 37%.

Chart 2.3: Huawei's direct contribution to UK tax revenues



Source: Huawei, Oxford Economics

The direct tax contribution of £50.3 million in 2014 alone was equivalent to 49% of Huawei's direct GDP contribution, compared to the equivalent UK economy-wide ratio of around 37%.

In 2012-2014, Huawei spent £546.9 million purchasing inputs of goods and services from other UK suppliers.

2.2 Indirect effects arising from Huawei's supply chain

Over the three years 2012-2014, Huawei spent a total of £546.9 million purchasing inputs of goods and services from other UK-based businesses[5], across a wide range of industries, with this so-called procurement total growing by 20.3% per annum over that time.

As an example of the sectors that Huawei procures from, engineering-type consultancy services account for the largest share, at £61.0 million in 2014, followed by electronic and electrical equipment at £40.1 million, telecommunications services at £37.4 million, management-type consultancy services at £17.2 million, and employment services at £15.3 million.

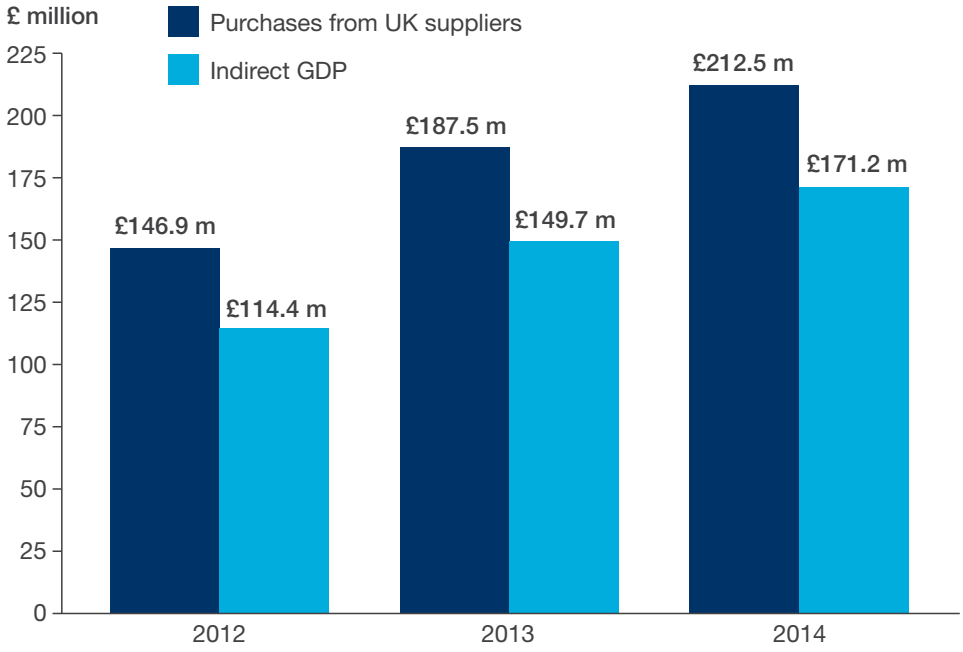
A small amount of the value of these purchases from UK suppliers can be accounted for by content that was ultimately imported further along the supply chain, with an even smaller amount needing to cover the cost of sales taxes on transactions within the supply chain. The majority, however, represents the GDP either of the UK suppliers to Huawei, or that of further rounds of UK-based suppliers. The value of this so-called indirect GDP impact is put at £435.3 million over the three years. Average annual growth in indirect GDP, between 2012 and 2014, amounted to 22.3%.

4 Business taxes as shown in the chart mainly comprise employers' national insurance, corporation tax and business property tax ('rates'). Employee taxes comprise income tax and employees' national insurance.

5 This includes purchases by Huawei's global headquarters as well as UK-to-UK transactions.

Chart 2.4 gives more details of these procurement and indirect GDP numbers.

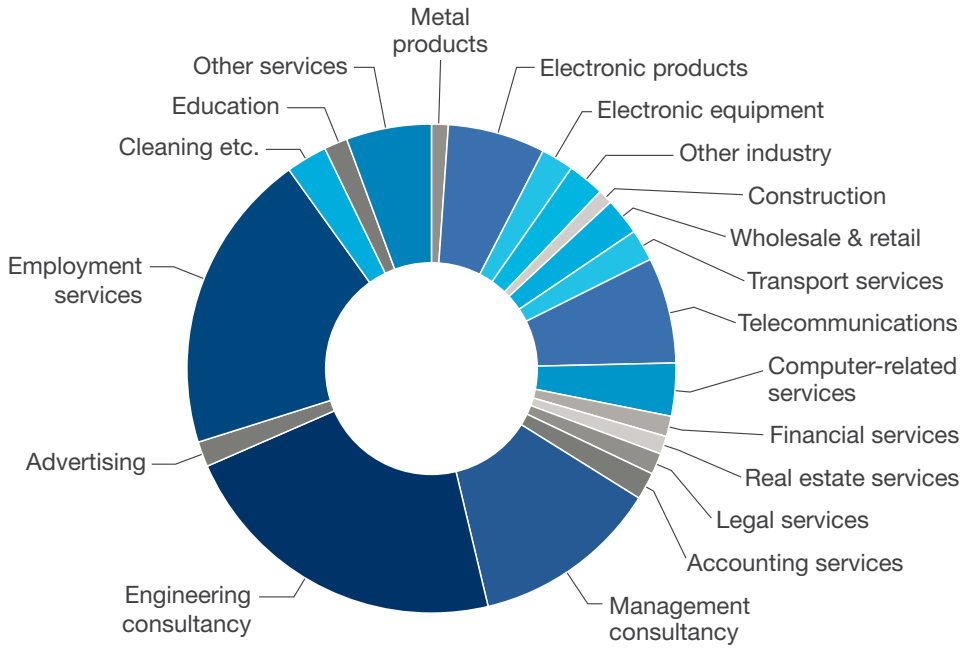
Chart 2.4: Purchases from UK suppliers and resulting indirect GDP



Source: Huawei, Oxford Economics

Supply chain jobs supported by these purchases grew by 21.1% per annum to reach 3,724 in 2014, with these employees spread across a wide range of activities.

Chart 2.5: Supply chain jobs supported by industrial sector in 2014



Source: Oxford Economics

This activity was sufficient to generate £125.7 million in indirect tax revenues over the three years[6], with these revenues growing at 21.5% per annum. It was sufficient to support annual growth of 21.1% in supply chain jobs, with indirect employment reaching 3,724 in the final year. The jobs supported are to be found in a wide range of sectors as illustrated by Chart 2.5.

6 The indirect tax take includes sales taxes, production taxes, corporation tax and employers' national insurance paid by businesses in the supply chain, and income tax and national insurance paid by their employees.

2.3 Induced effects arising from wages being spent

When employees of Huawei and those in its supply chain spend their wages, which have been effectively derived from Huawei's activities, further so-called 'induced' benefits are created for local retailers, leisure outlets and other consumer-facing businesses, and for suppliers to those businesses in turn. This so-called induced GDP is estimated to have totalled £289.8 million over the three years, supporting tax revenues[7] of £157.1 million, with annual growth in these measures averaging 24.3% and 23.1% respectively.

Associated with this, Huawei's induced jobs contribution grew by 22.3% per annum between 2012 and 2014, to reach 2,631 jobs in the latest year.

For every individual employed directly by Huawei in 2014, an additional six UK-based jobs were supported by supply chain linkages and employee spending.

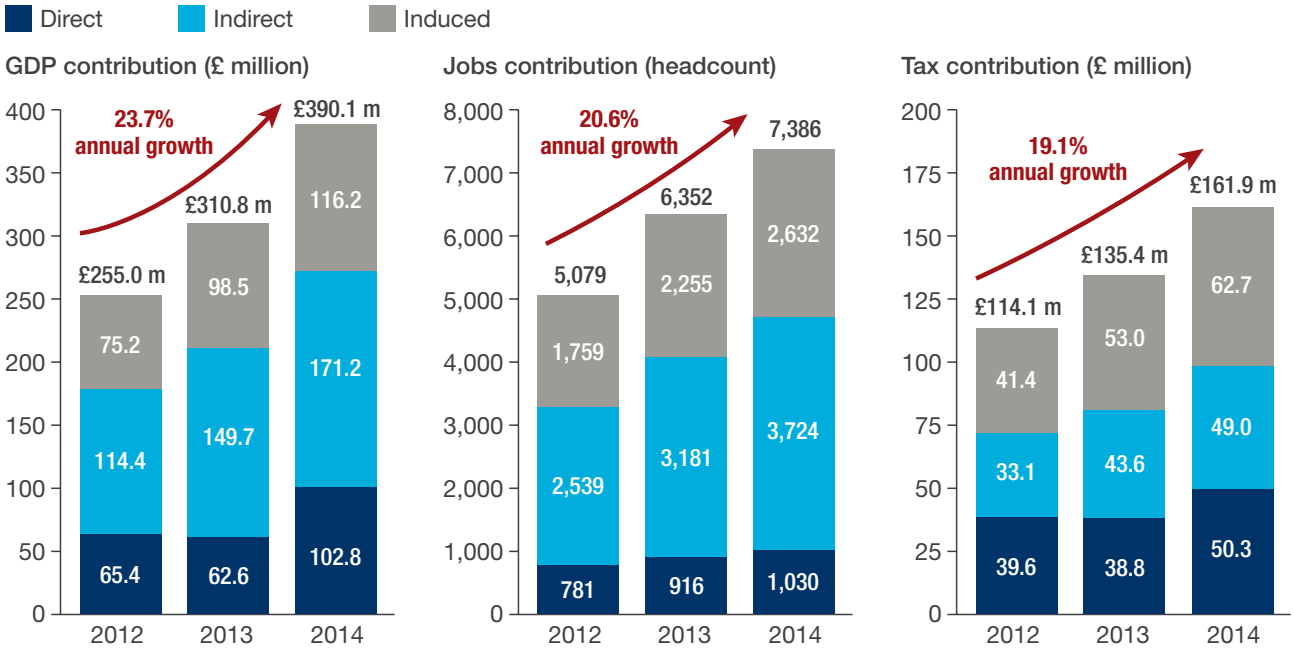
2.4 Huawei's total economic impact, 2012-2014

Taking the direct, indirect and induced impacts together, Huawei's total contribution to UK GDP can be put at £955.9 million over the three years 2012-2014. During that time this contribution grew by 23.7% per annum, which is sufficient to support annual growth of 20.6% in the total number of jobs. This in turn took the total jobs contribution to 7,386 in 2014, meaning that, for every individual employed directly by Huawei, an additional six UK-based jobs were supported by supply chain linkages and employee spending.

Huawei's total tax contribution, meanwhile, totalled £411.4 million over the three years. This contribution grew by 19.1% per annum, so that in the final year it would have been sufficient to have covered the wages of 5,130 full-time nurses.[8]

Chart 2.6 shows greater detail on the breakdown by channel of impact and year.

Chart 2.6: The economic impact of Huawei in the UK, 2012-2014



Source: Oxford Economics

7 This includes sales taxes (e.g. VAT and excise duties) on the consumer spending of Huawei employees and those in its supply chain, as well as sales taxes, production taxes, corporation tax and employers' national insurance paid by businesses in the consumer supply chain, and income tax and national insurance paid by their employees.

8 Based on the average pay of a full-time nurse in that year, sourced from: ONS, Annual Survey of Hours and Earnings, 2014 provisional results.

2.5 Huawei's economic contribution by region

Huawei's activities and employees are spread around the UK.

Huawei now has 15 offices located across the UK. These include:

- Its new headquarters in Reading, opened in 2013 following a move from Basingstoke.
- The CIP research and development centre in Ipswich, acquired in 2012 and now with a workforce of more than 80, as well as a second office at Adastral Park, Ipswich.
- The R&D site in Cambridge, following the acquisition of Neul in 2014.
- A brand new R&D centre established in Bristol in 2014.
- The Huawei Global Finance Centre in the City of London, opened in 2013.
- The UK Cyber Security Evaluation Centre in Banbury, Oxfordshire, established in 2010.
- Further workplaces in Manchester, Newbury in Berkshire and Newport in South Wales.

In addition the company is engaged in a number of partnerships with UK universities, and therefore in activities taking place on their campuses (for example the research on emerging 5G network technology at the University of Surrey in Guildford).

Information on staff costs, employee taxes and purchases of goods and services, by postcode of employee and supplier, were provided by Huawei to Oxford Economics, enabling the regional distribution of the direct, indirect and induced contributions to be estimated. The results are summarised in Table 2.2.

Table 2.2: The economic contribution of Huawei to the UK by region

£ million (total, 2012-2014)	South East	East of England	London	South West	Yorkshire and the Humber	North West	Rest of UK	Total UK
Direct GDP	135.5	33.0	30.4	12.4	0.9	5.1	13.4	230.8
Indirect GDP	122.7	120.2	70.5	13.6	60.2	26.4	21.8	435.3
Induced GDP	109.8	57.9	56.1	11.6	20.4	14.7	19.2	289.8
Total GDP contribution	368.0	211.1	157.1	37.7	81.5	46.2	54.4	955.9
Total tax contribution	168.3	86.4	66.9	16.5	31.2	18.3	23.9	411.4
Headcount	**South East**	**East of England**	**London**	**South West**	**Yorkshire & the Humber**	**North West**	**Rest of UK**	**Total UK**
Total jobs contribution 2012	1,991	619	663	206	664	424	511	5,079
Total jobs contribution 2013	2,004	1,792	925	198	546	444	442	6,352
Total jobs contribution 2014	2,542	2,436	788	536	451	345	289	7,386

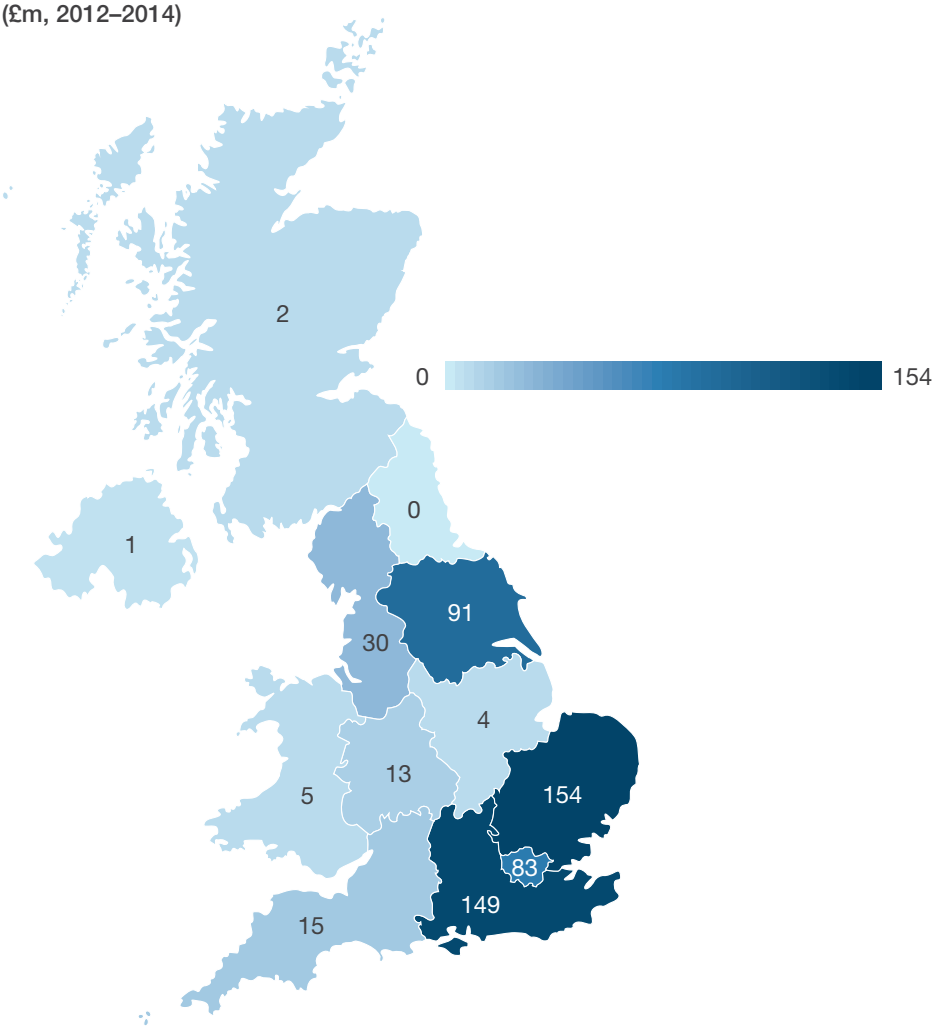
Source: Oxford Economics; Huawei

In the course of the three years Huawei purchased inputs from suppliers located in 86 out of the UK's 121 postcode areas.

Focusing first on supply chain impacts, in the course of the three years Huawei purchased inputs of goods and services from suppliers located in 86 out of the UK's 121 postcode areas. Chart 2.7 illustrates how this translates into purchases by standard UK region.

Chart 2.7: Huawei purchases of goods and services by region, 2012-2014

(£m, 2012–2014)



Total GDP contributions of £10 million or more were made over 2012-2014 in eight out of the nine English regions.

Chart 2.8 meanwhile illustrates the regional distribution of Huawei's total contribution to GDP. This takes into account supply chain linkages between the regions as well as the regional distribution of Huawei's own activities. It also includes the regional distribution of the induced impact, which is derived from the distribution of the spending power of Huawei and supply chain employees.

The largest impacts are found in the South East, East of England and London, but contributions of £10 million or more were made to the economies of eight out of the nine English regions.

Chart 2.8: Huawei's total GDP contribution by region, 2012-2014

(£m, 2012–2014)

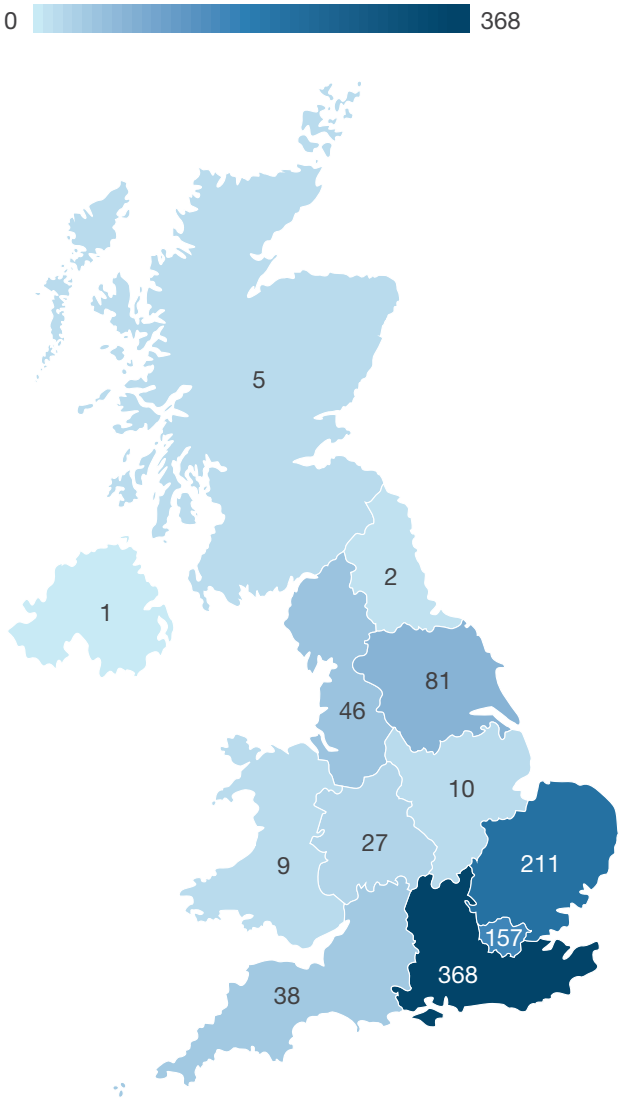
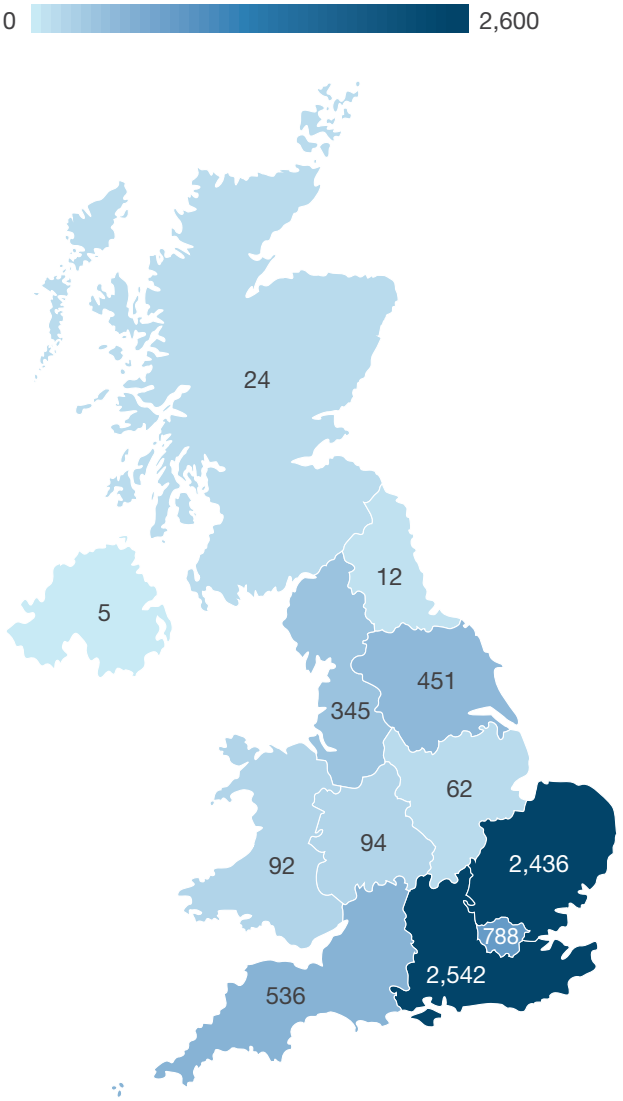


Chart 2.9: Huawei's total employment contribution by region in 2014

(headcount, 2014)



Reasonably significant total jobs impacts are found in the South West, Yorkshire and North West, in addition to the strong jobs support provided for the South East, East and London.

In terms of the resulting total jobs impact in 2014, the largest contributions are found in the South East and East of England, followed by London, but significant impacts – of well over 300 jobs in each case – are also found in the South West, Yorkshire and the Humber, and North West.

3 Benchmarking against the public commitment made in 2012

In 2012 Huawei made a commitment to spend £1.3 billion in the UK over 2013-2017, split evenly between investment and procurement.

In September 2012 Huawei announced a commitment to spend £1.3 billion (US$2 billion) in the UK over the following five years, i.e. 2013-2017, with this comprising £650 million of investment and £650 million of procurement. This chapter assesses Huawei's recent performance in terms of achieving those goals. It includes a detailed look at Huawei's R&D activities which form the major part of its investment outlays.

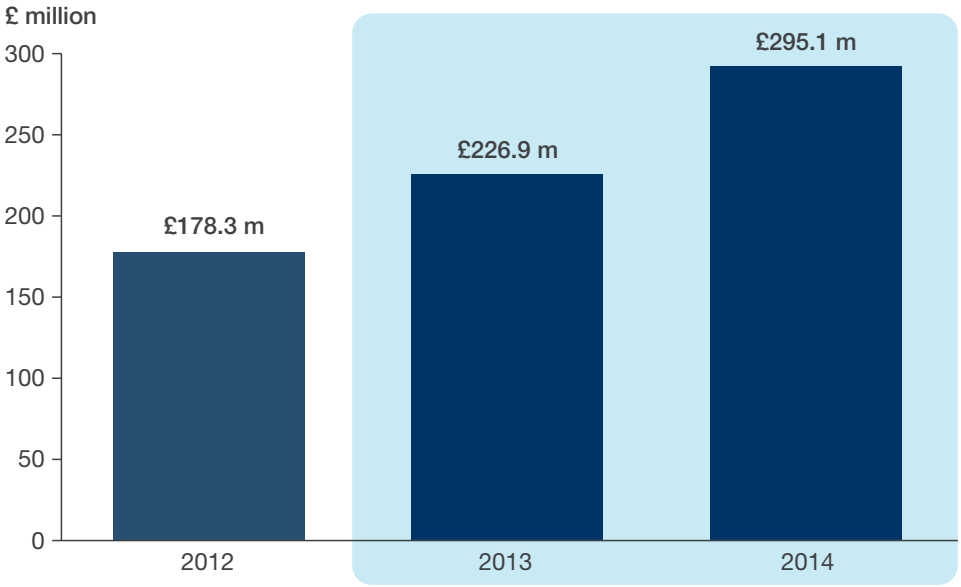
In the charts throughout this chapter, the relevant first two years of Huawei's 2013-17 commitment are highlighted in blue boxes.

3.1 Performance against the total expenditure commitment

Sections 3.2 and 3.4 investigate the recent performance of Huawei in terms of whether the company is on track to meet, respectively, the individual commitments on procurement and investment. But looking at the total of these two spending categories first, we know that this amounted to £226.9 million in 2013 and £295.1 million in 2014 (Chart 3.1). So even if this spending were merely held at the 2014 level through to 2017, then the total over the five relevant years would be £1.41 billion – i.e. meeting the total combined commitment.

The combined target for procurement and investment would be achieved even if the 2014 level were merely maintained.

Chart 3.1: Huawei's total procurement and investment spending



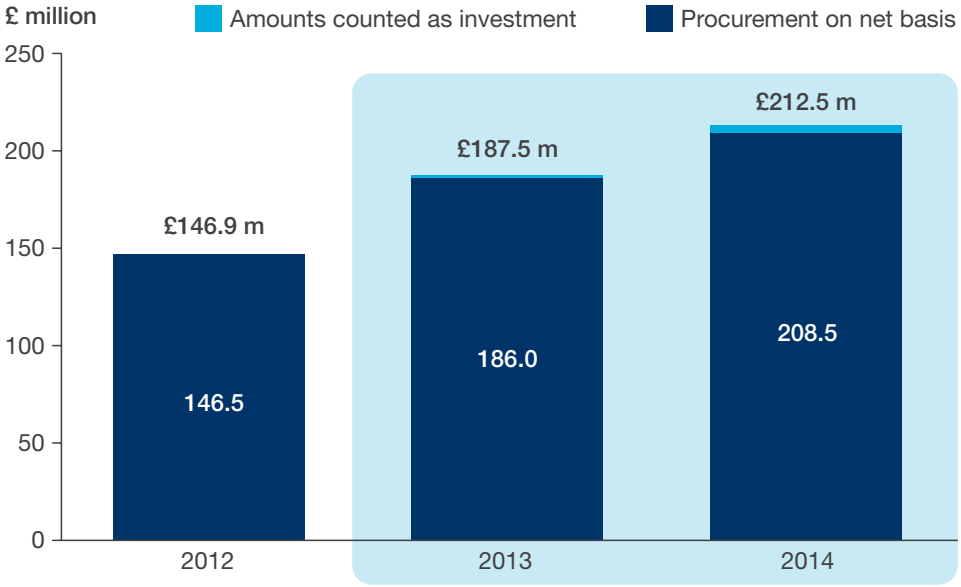
Source: Huawei

3.2 Performance against the procurement commitment

As set out earlier Huawei's total procurement from UK-based suppliers totalled £187.5 million in 2013 and £212.5 million in 2014. A very small amount of this procurement – relating to spending on human capital and the cost of running Huawei Global Finance – is counted as investment for the purposes of this benchmarking exercise (see Section 3.4 below), but even excluding these amounts a total of £394.5 million was spent in the two latest years (Chart 3.2).

The target for procurement alone would also be comfortably achieved on the basis of simply maintaining 2014 activity levels.

Chart 3.2: Huawei's procurement from UK-based suppliers



Source: Huawei

This means that even if net procurement spending were only maintained at the 2014 level over the next three years, the total over the five years 2013-17 would amount to £1.02 billion – comfortably meeting the objective.

3.3 Huawei's investment in R&D

Huawei currently employs 156 people in its UK research and development operations, with this number set to rise to 300 by 2017.

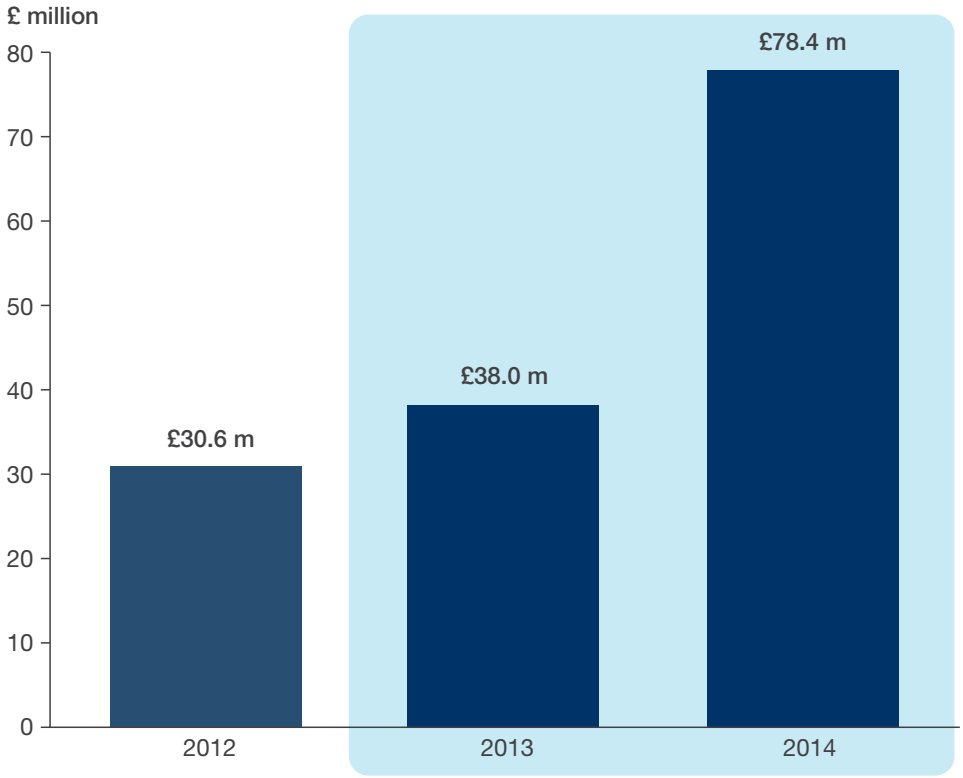
Given the nature of its business, Huawei's spending on physical assets such as buildings, plant and machinery is comparatively small. It does however undertake significant amounts of research and development work, which falls within the national accounts definition of fixed investment ('fixed capital formation') as that also includes investment in 'intellectual property products'.

An example of this R&D work would be the Huawei UK Innovation Programme, launched in 2014. As part of this programme a new high-calibre research and development centre was opened in Bristol, focusing on researching ICT chips, software, and chip technology for the future.

Huawei has also established a series of joint innovation centres, at which it collaborates with key customers and pioneers new technologies. The company has 18 of these centres worldwide, with the UK centre focused on R&D with BT and Vodafone, two of its most important UK-based customers.

As Chart 3.3 shows, R&D spending falling within the national accounts definition of investment amounted to £30.6 million in 2012, rising to £38.0 million in 2013 and £78.4 million in 2014 – meaning a growth rate of 60.2% per annum. These figures include the R&D activities of CIP and, in 2014, the newly acquired Neul, together with R&D-type activities at the Device Design Centre and Cyber Security Centre, and co-operation on ICT and software development with both commercial and university partners.

Chart 3.3: Huawei's R&D activity in the UK



Source: Huawei

Huawei has made a number of commitments to build on its UK-based R&D activities, including a programme of joint working with universities worth £10 million over four years.

3.3.1 Co-operation with universities and other specific developments – Case Study 1

In December 2013 Huawei announced plans to invest a further £10 million over 2014-17 "to support technology research programmes with world-renowned British universities", to build on the strong engagement of recent years.

A large aspect of this programme focuses on developing 5G technology. The intention is that 5G will offer around 1,000 times more capacity than current 4G technology, with speeds many times faster. 5G technology is expected to become the underpinning for the Internet of Things (IoT), in which billions of everyday objects will become 'smart' through wireless internet connections. Huawei's investment in this area will not only support 5G itself, but other related technological advances too.

The investment also includes key collaborations with these British universities, with a focus on advanced multimedia, IT and optical technology, green radio, wireless communications and product engineering. The funding has been made available through the Huawei Innovation Programme, which extends the company's long-term focus on research and development into the academic world by forging partnerships with global educational institutions.

The research programmes are aimed at significantly improving Huawei's understanding of these cutting-edge technologies, enabling the company to improve the consumer, network and enterprise services and solutions it offers.

Huawei also opened a new R&D centre in Bristol in 2014, with the work there focusing on researching ICT chips, software and chip technology for the future. Taking this initiative into account, the number of Huawei staff focused solely on R&D activity stood at 156 by May 2015. Huawei plans for this number to grow to 300 in 2017.

Box 3.1: Huawei's involvement with the University of Surrey's 5G Innovation Centre

Photo: University of Surrey

Huawei's involvement with the University of Surrey's 5G Innovation Centre (5GIC) in Guildford, Surrey, provides a good example of Huawei's collaborative work. Announced in November 2014, the 5GIC aims to be the world's leading independent facility for researching and trialling 5G technologies. As part of this programme, Huawei and other technology partners are working to develop the world's first 5G testbed at the University's campus, to test emerging technologies in a real-world environment. One of the founding members of the 5GIC, Huawei has provided expertise in and equipment for large scale radio access for the testbed, and is investing £5 million in the Centre.

Currently under construction, the first phase of the testbed will be operational by mid-2015. This will be used collaboratively by 5GIC researchers and industry partners to develop and test advanced technologies and actively contribute to shaping the communications standards of the future. In due course, it is envisaged that 5G will deliver unprecedented data speeds and transform wireless communication, allowing a myriad of applications in the Internet of Things in areas such as healthcare, transport, vehicle telematics, the development of smart cities and entertainment.

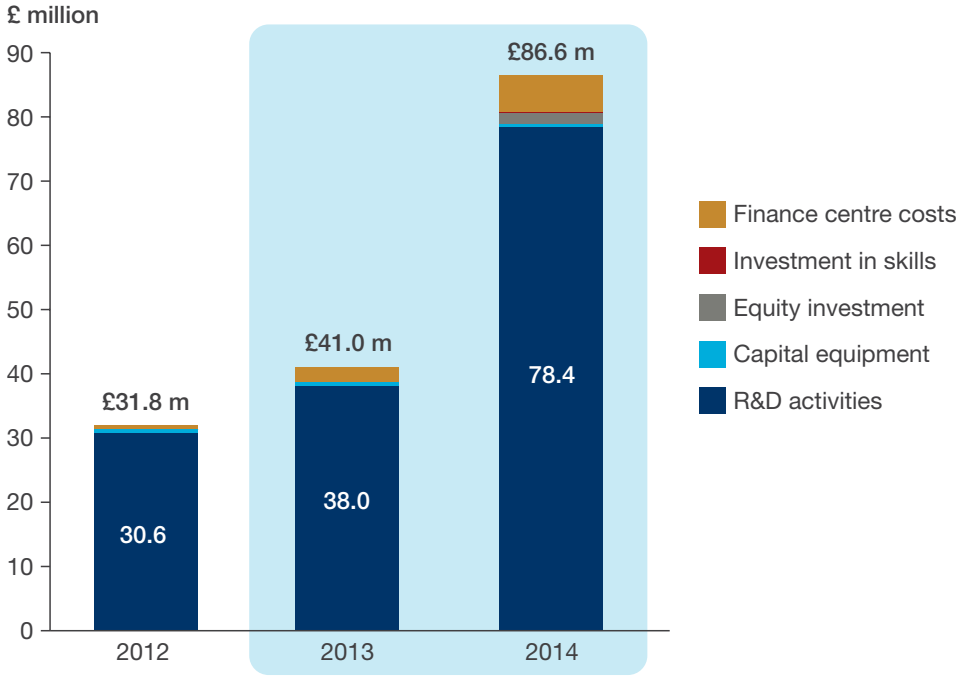
3.4 Performance against the investment commitment

In assessing Huawei's spending against the target, we need to look at a slightly broader definition of investment in line with Huawei's intended goals. As well as R&D outlays, Chart 3.4 therefore also includes:

- Spending on fixed capital equipment such as hardware.
- The purchase of equity stakes in other firms undertaking R&D-type activities. So far this has included only one such purchase, relating to XMOS, in 2014.
- Spending on development of the UK skills base, including the cost of the Seeds for the Future CSR project.
- The costs involved in running Huawei Global Finance, which should ultimately yield broader benefits not just for the company but for the wider UK economy (see Section 3.4.1 below).

The target for investment broadly defined would be met if the recent rate of growth in those outlays, even excluding 'one-off' impacts, continued through to 2017.

Chart 3.4 Huawei's investment on a broader definition



Source: Huawei

Total investment on this broader basis amounted to £41.0 million in 2013 and £86.6 million in 2014. To meet the target for 2013-17, investment on this basis would have to total £522 million over the three years 2015-2017, or an average of £174 million per annum, requiring growth of 40% per annum.

Recent past performance suggests that this can indeed be achieved. The average increase over the two years to 2014 was 65%, or 57% even if 'one-off' impacts – the effect of Neul and the purchase of XMOS equity – are excluded. If this 57% per annum 'underlying' growth rate were maintained through to 2017, investment broadly defined would total £810.6 million over the five year period 2013-2017.

The achievement of the target will be helped by plans to develop Huawei's own R&D outlays (as described in Section 3.3 above) and to undertake the staff training necessary as the UK-based workforce grows to the target of over 1,500 by 2017. In addition, Huawei will continue to look for the potential to take up suitable equity stakes in other UK-based R&D-rich businesses.

The opening of Huawei Global Finance aligns with the UK government's desire to maintain London's pre-eminent position as a global financial hub.

3.4.1 The activities of Huawei Global Finance – Case Study 2

Box 3.2 examines the role of the recently-opened Huawei Global Finance centre, based in London, showing how this contributes to the UK government's policy aim of maintaining London's pre-eminence as a global financial hub.

Box 3.2: The role of Huawei Global Finance Centre

In November 2013 Huawei announced the opening of its new Global Finance Centre of Excellence in London, which was evolved into Huawei Global Finance (UK) Limited earlier this year. London has long been recognised as one of the world's leading centres for global finance, a role which the Government is keen to maintain as the Financial Secretary to the Treasury stated at the time of Huawei's announcement:

"We are proud of this position. We intend to work hard to keep London pre-eminent in the global financial sector."

The opening of Huawei Global Finance clearly aligns with this goal. When the announcement was made the Secretary of State stated: "Huawei's announcement reiterates London's position as a key financial hub." The UK Government is keen for more Chinese businesses to use the UK as a financial centre and Huawei's decision to locate the finance company here can be seen as setting an example to those other enterprises.

The company chose London as the base for Huawei Global Finance due to "its strategic role as a leading global financial hub, with associated support services and a workforce with the necessary skills and expertise to realise operational excellence".

Huawei Global Finance is responsible for the critical financial functions of Huawei's extensive global operations, including treasury, accounting risk and credit control. It is a key financial risk assessment and control centre for the global company, reinforcing its international finance capabilities. It employs teams of senior professionals who advise globally on credit and financial restructuring and recovery.

In the 18 months since the November 2013, operations have grown, with employment now standing at around 60 and plans to grow to up to 130 local and expat employees by the end of 2015. A significant majority of local employees are senior experts with over 15 years' experience providing internal global advisory services to the Huawei group on treasury, accounting and credit matters. Such growth has resulted in the centre recently increasing its office space in the City of London.

Further growth in the operations of Huawei Global Finance is expected in the years immediately ahead, bringing closer cooperation between London and Huawei's headquarters in China. Activities currently being established include setting up a fixed income portfolio in excess of $1bn and FX transactions concentration to be held in London. These businesses will result in trading relationships with over ten financial institutions located in London, and intercompany funding and payment structures with global transactions flowing through Huawei Global Finance. The finance company also regularly engages the London offices of the large audit, advisory and legal firms to support its activities.

4 Huawei's wider contribution to the UK

This chapter completes our analysis of Huawei's contribution to the UK economy and society by examining:

- The company's role in pursuing technological advances that benefit the UK consumer.
- The benefits of Huawei's UK R&D activity for the wider UK economy.
- Further contributions to the UK's economic and social policy ambitions.

Without the contribution of technological solutions along the lines provided by Huawei, the significant benefits set to be delivered by 4G, in terms of both consumer satisfaction and economic productivity, would not be possible.

4.1 Advances benefiting the UK consumer

Working closely with its partners, Huawei has played an important role in the recent technological advances in the field of telecommunications, greatly benefiting the UK consumer. This is best illustrated by its co-operation with EE in the roll-out of that company's 4G network (Box 4.1).

4.1.1 Huawei's partnership with EE – Case Study 3

The importance of the first of these partnerships is brought out by the findings of a recent study of the mobile telecommunications industry undertaken by Capital Economics for EE[9]. Concerning the sector as a whole, that report states that the UK industry offers consumers access to the third cheapest mobile phone services out of the OECD group of 34 industrialised economies. It went on to estimate that the 'consumer surplus' – the difference between the hypothetical maximum that consumers would have been prepared to pay for its services and the amount actually paid – to have been between £28 billion and £34 billion in 2013.

On 4G Long Term Evolution (4G LTE) specifically, the report highlighted how:

- The technology delivers a step change in mobile broadband speeds compared to the predecessor system, 3G.

9 Capital Economics, Improving connectivity – stimulating the economy: Mobile network operators and the UK economy, November 2014.

- As a result of the significant amount of investment recently undertaken, the UK now has the fourth largest number of 4G subscribers in the world, despite being the 53rd country to launch the technology.
- 4G LTE could boost the 'consumer surplus' delivered by the industry by £2 billion per annum.
- The eventual productivity gains from 4G LTE could be worth around 0.7 per cent of gross domestic product, or £12 billion annually.

The significant benefits set to be delivered by 4G, in terms of both consumer satisfaction and economic productivity, would not be possible without the contribution of technological solutions like those developed by Huawei and its partners.

Furthermore, as a technology leader, Huawei's beneficial contribution to the UK consumer is not just limited to 4G. For example, Huawei's Smart City portfolio includes cutting edge new technologies and expertise which is helping to address some of the world's most pressing urban challenges, from traffic to health and education. To date Huawei has provided Smart City solutions in over 60 cities across more than 20 countries worldwide and this experience is directly beneficial to the UK.

Box 4.1: Huawei's partnership with EE

As a leading technology developer and equipment vendor, Huawei has been EE's core partner in building its 4G network, ever since it launched in 2012. The two companies have collaborated closely on a number projects over several years to bring the latest technology from the test bed to real-world deployment. Huawei's 4G R&D has brought real benefits to more than 10 million current EE 4G customers and will do so for many more in the future.

Huawei supplies all of the hardware equipment which EE installs in each of its base stations, which are then connected to the radio antennae that provide the 4G mobile coverage. The technology developed by Huawei has enabled EE to build Europe's largest 4G network, with coverage to nearly 90% of the UK population across the largest 500 towns and cities, and thousands of villages. It is the fourth largest such network anywhere in the world, providing speeds of up to 60 Mb/second, faster than the average fibre broadband speed.

In 2013, Huawei and EE announced the next stage in their partnership, which was the launch of the world's fastest 4G LTE Advanced, in London's technology hub, Tech City. Huawei's LTE Advanced technology is the next generation of wireless broadband network, which doubles the speed of most existing 4G networks, by making more efficient use of available radio spectrum. It allows operators to provide high-performance mobile applications and multimedia including video conferencing, high-definition content transmissions, high-speed video downloads and social networking platforms. Huawei also develops the handsets and other devices necessary to utilise the benefits of this technology.

In July 2014, Huawei announced that it was again partnering with EE (and Qualcomm) to trial its latest 4G broadcast technology, known as eMBMS (Evolved Multimedia Broadcast and Multicast Service). This is a multicast technology that is designed to give mobile operators a more efficient and cost-effective means of sending popular content to a large number of customers simultaneously over an existing 4G network. Huawei provided the network components over which the content is delivered and the intelligence which allows it to be broadcast.

In 2015, the partners took this one stage further when they demonstrated the capabilities of LTE Advanced to deliver download speeds of more than 400Mb/second in a live test environment at Wembley Stadium. This latest development from Huawei and EE will make it possible for many users simultaneously to access speed-hungry applications, such as 4K video, by maximising by the capacity and speed of the EE network.

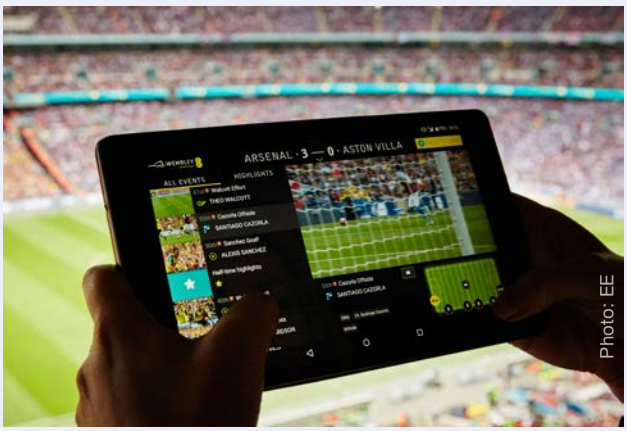


Photo: EE

4.1.2 Huawei's partnership with Openreach – Case Study 4

Box 4.2 meanwhile summarises Huawei's partnership with Openreach, which has also benefited UK consumers.

Box 4.2: Huawei's partnership with Openreach

Huawei has been a supplier to BT and more recently Openreach, its network infrastructure and delivery business, for more than 10 years. Huawei was selected in 2005 to be a transmission and access supplier for the 21st Century Network (21CN) major network upgrade project.

Over that decade Huawei has supplied multi-service access node products and core optical products to Openreach. In the last few years we've supplied kit for the Openreach Next Generation Access (NGA) programme – aiming to increase broadband speeds.

Huawei has played a significant role in supplying Openreach. Our equipment has been deployed throughout the UK. We have also supplied 'head end' exchanges, modems and home hubs.

As well as supplying kit for fibre rollout, Huawei has also supported Openreach and BDUK (Broadband Delivery UK) in extending broadband availability to rural areas.

R&D activity can result in economic gains well in excess of the commercial return subsequently captured by those carrying out or funding the activity.

4.2 How Huawei's R&D benefits the wider UK economy

Through its commitment to supporting the UK to become a world leader in ICT, Huawei invests over 10% of its total revenue into R&D at a global level and, as set out in Section 3.3, it spent £78.4 million on these activities in the UK in 2014. In this section we explore the extent to which these activities can be expected to benefit the wider UK economy.

Huawei's spending on R&D should generate significant sales revenues for the business itself further into the future. But the economic benefits from research and development are not confined to such 'private' returns. The work can also lead to gains for other UK-based entities, and benefit the wider UK economy and society, through so-called 'positive spillover impacts'.

These spillover benefits can arise through the following channels:

- Sale of products embodying new technology and consequent take-up and imitation.
- Migration of staff from one firm to another, taking their knowledge with them.
- Shared access to intellectual capital, for example through collaborative research and/or university links.
- Partnerships between large firms and their suppliers aimed at improving the suppliers' products and processes.
- Other transfers of know-how through interlocking supply chains and knowledge sharing.

Academic studies have sought to quantify the economic benefits of R&D[10]. The private return to this activity[11] is broadly 25% on average in the literature, but the total return is found to be in the order of 70%. The average spillover return – the difference between the two – can therefore be put in the region of 45% per annum.

Furthermore, although such spillover benefits can in principle work across international borders, there is academic evidence to support the view that 'within-country' spillover benefits are much more significant than 'cross-border' spillover benefits.[12] This makes sense as, for example, an employee is much more likely to move between two businesses in the same country than to move across borders. Similarly, transfer of know-how through joint project work or through supply chain linkages, although possible across borders, is also more likely to occur between businesses located closely geographically.

The wider UK economy therefore stands to benefit much more from the R&D that Huawei undertakes specifically in the UK than it does from R&D activity undertaken elsewhere.

If Huawei simply maintained R&D activity at the 2014 level, the GDP benefit to the rest of the UK economy would eventually settle in the region of £310 million per year.

On the basis of standard assumptions[13] used by Oxford Economics based on the academic work referred to above, if Huawei maintained the volume of R&D activity undertaken in the UK in 2014 on an indefinite basis, the total benefit to the economy would eventually settle at around £480 million per annum (measured at today's prices). Of this amount, Huawei could be expected to capture £170 million per annum as a result of improved commercial returns, but there would be a larger spillover benefit to the wider UK economy on top of that, building eventually to £310 million per year.

If UK R&D activity were stepped up to, say, £200 million per annum – which would be potentially consistent with the step-up in total investment required by 2017 to meet the five-year investment target – then the spillover benefit to the rest of the UK economy would eventually settle at around £790 million per annum.

More specifically, these benefits are likely to accrue initially to other businesses located geographically close to Huawei's R&D centres in Ipswich, Cambridge and Bristol, and close to the universities with which Huawei is co-operating, reflecting academic findings that spillover benefits will tend to be captured, at least initially, by businesses in the same neighbourhood, before spreading further afield gradually over time[14].

10 A summary can be found in, for example, Department of Trade and Industry (DTI), Economics Paper 5: DTI Strategy – The Analysis, November 2003, page 17.

11 The return to R&D is calculated in relation to the 'stock' of R&D – that is, the cumulative amount of R&D spending over many years with some allowance for 'depreciation'.

12 For example, Adam B Jaffe and Manuel Trajtenberg, Flows of knowledge from universities and federal laboratories: modeling the flow of patent citations over time and across institutional and geographic boundaries, November 1996.

13 A total return of 70% per annum on the R&D 'stock', split in a 25:45 ratio between private and spillover benefits, with the 'stock' depreciating at 10% per annum and no benefit felt after 20 years.

14 See for example Adam B Jaffe, Manuel Trajtenberg and Rebecca Henderson, Geographic localization of knowledge spillovers as evidenced by patent citations, Quarterly Journal of Economics, August 1993.

The company's activities also benefit the UK economy and society in several other ways.

4.3 Further contributions to the UK's policy ambitions

4.3.1 Alignment with the UK government's broader growth strategy

Huawei is committed to forging close partnerships in and to playing an active role in helping the UK economy grow and develop as a world-leading ICT and digital economy.

Just as Huawei Global Finance's London location supports the government's goal of maintaining the UK's pre-eminence as a global financial hub, so the company's core operations centred on technological advance align with the government's broader economic, trade, innovation and growth strategies.

Responding to Huawei's September 2012 £1.3 billion investment and procurement plan for the UK, Prime Minister David Cameron stated:

"The investment announced by Huawei today demonstrates once again that the UK is open for business. I welcome this and I want to see more companies invest in the UK as we work to achieve sustainable and balanced growth within our economy. The British Government values the important relationship with China, both countries have much to offer each other and the business environment we are creating in the UK allows us to maximise this potential."

The British government has claimed that the UK is "one of the world's most digitally advanced countries", and wants to continue the country's digital growth and development.[15]

Huawei has developed the Global Connectivity Index (GCI), which benchmarks the performance of a range of mature and developing economies in terms of the availability and use of five major ICT technologies, namely cloud, the Internet of Things, Big Data, broadband, and datacentre. The GCI report for 2015[16] concludes that countries can be grouped into 'Leaders', 'Followers' and 'Beginners' based on their GCI performance, with the UK falling into the first of these categories. Leaders have a better supply of connectivity, but more importantly have invested to drive better adoption in demand. They also benefit from a key factor for ICT development, namely experience.

In fact the UK is high up amongst the Leaders in the GCI, being ranked fifth out of the 50 nations included in the study. Huawei's £1.3 billion commitment aligns with the government's ambition for the UK to maintain and build on its position as a front-runner among the world's digital economies.

15 https://www.gov.uk/government/speeches/opening-speech-for-d5-byfrancis-maude-minister-for-the-cabinet-office

16 Huawei, Global Connectivity Index 2015: Benchmarking Digital Economy Transformation. The link to the GCI microsite is here: http://www.huawei.com/minisite/gci/en/index.html?utm_source=hp_nav&utm_medium=wwwEN&utm_campaign=HomeFlow

4.3.2 Commitment to good corporate governance

In February 2015 Huawei announced the appointment of Lord Browne of Madingley as independent non-executive chairman of its UK subsidiary, Huawei Technologies UK. Alongside Lord Browne, the Company also announced the appointment of two further independent non-executive directors to the Board of its UK subsidiary, Dame Helen Alexander, chairman of UBM plc and Sir Andrew Cahn, who served as chairman of Huawei UK's Advisory Board from 2011 to 2014. The inclusion on Huawei UK's Board of senior business figures, with such wide ranging experience, demonstrates Huawei's commitment to corporate governance as a foundation for further growth and success. These independent non-executive directors are responsible for reviewing the performance of Huawei in the UK, where 75% of employees are recruited locally, and providing counsel to the UK Management Team, as well as the standard legal obligations of directors of a UK limited liability company. The enhanced UK Board that Lord Browne leads has six directors – three non-executive and three executive.

Speaking at the time of his appointment, Lord Browne, Chairman of the Huawei UK Board, said: "It is an honour to serve as the first independent Chairman of Huawei's Board in the UK. In a short period of time, Huawei has become a global leader in technology and one of mainland China's largest investors in the UK. I have worked in China and with Chinese businesses for the past 40 years, and continue to be impressed by the corporate sector's ambition and potential. I am delighted to be leading this Board as it supports Huawei's next phase of growth."

The three executive directors on the UK Board, sitting alongside the non-executive directors, are: Ken Hu, Deputy Chairman of the Board, Rotating CEO, Huawei Group; Chen Lifang, Board Director and Senior Vice-President, Huawei Group; and Gordon Luo, CEO, Huawei UK.

4.3.3 Attracting visitors to the UK by hosting global events

In addition to the monetary and employment contributions to the UK economy that we have been able to capture through the direct, indirect and induced channels, Huawei contributes to the nation's competitiveness in other ways, thereby generating additional income for the local economy.

A key example of this is the hosting of events attracting participants, journalists and other visitors from all over the world, thereby generating revenues for UK-based businesses in the hospitality and transport services sectors amongst others. For example between September 2013 and August 2014, Huawei hosted five events in London including the Huawei Managed Services World Summit, the Global Mobile Broadband Forum and the Global Professional Services Forum.

4.3.4 Corporate social responsibility

Huawei also takes corporate social responsibility seriously, listing amongst its key goals:

- Promoting environmental protection.
- Seeking win-win development.
- Bridging the digital divide.
- Safeguarding stable and secure network operations.

These additional contributions include a clear commitment to corporate social responsibility.

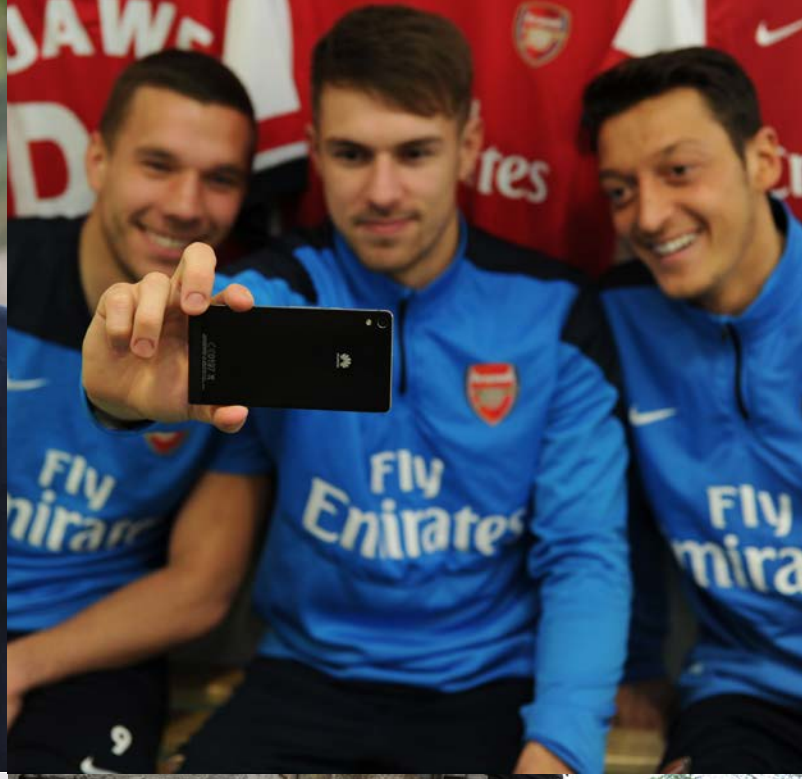
Huawei created a comprehensive Sustainability Strategy in 2012 which it has been implementing over the last three years. Huawei promotes sustainable development by providing energy-efficient green ICT solutions that reduce carbon emissions and drive economic growth. It also collaborates closely with its customers to develop energy-efficient products and solutions, enabling them to reduce CO2 emissions and operating expenses.

In 2015, Huawei was awarded the BT Sustainability Gold Award at the BT Better Future Supplier Forum (BFSF), having gained Silver Award status in 2013. The scheme was set up to drive innovation in sustainability throughout BT's supply chain – a venture that has so far cut CO2 emissions by more than 250,000 tonnes.

Huawei's 'Seeds for the Future' programme was successfully piloted in the UK in 2011 and has now been adopted as Huawei's global corporate responsibility programme which last year saw over 400 students from around the world visit China for valuable work experience. From a UK perspective Huawei offers increasing numbers of talented STEM (Science, Technology, Engineering and Maths) undergraduates with the opportunity to travel to China on a four-week programme which provides valuable Mandarin training and work experience in Huawei HQ in Shenzhen. In 2015, Huawei will send 32 UK students on the 'Seeds for the Future' programme and since 2011 has so far sent over 100 students to China. As part of Huawei's investment pledge to the UK market in 2012 Huawei aims to send 50 students a year to China by 2017.

In addition:

- Huawei is a member of the Prince's Trust Technology Leadership Group and hosts a Winter Concert each year in support of the charity.
- The company was honoured with four awards at the World CSR Day conference: two in the field of 'Support and Improvement in Quality of Education', one for 'Corporate Responsibility in Education' and one for 'Green IT Initiative and IT Excellence'.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Annex: Economic impact methodology

Effect type	Basis of calculation	Sources
Direct effects		
GDP	Calculated as the sum of total employment costs (including employer pension and national insurance contributions), gross profits before tax, interest and depreciation, and taxes on production (business property rates only in this case). The regional split is based on wage costs, employer NICs and employer pension contributions by postcode, with the profit and production tax elements assumed to be distributed in line with the wage bill. All CIP and Neul employment costs are allocated to the East of England.	**Huawei:** Data on staff costs (by postcode of employee), gross profits and taxes on production.
Employment	Taken as headcount at the end of each year. The regional split is assumed to be in line with the split for the wage bill.	**Huawei:** End-of-year staff headcount.
Taxation	Taken to be the sum of net VAT payments on Huawei's sales, employers' national insurance contributions, corporation tax, business property tax (rates), other sales and business taxes, and staff payments of income tax and employees' national insurance. For the regional split, income tax and NICs are taken from the employment cost data by postcode. Other taxes are allocated in proportion to the wage bill.	**Huawei:** Company and staff tax payments (with employment taxes broken down by postcode of the employee).
Indirect effects		
GDP	Huawei's purchases of goods and services from other UK-firms were allocated across the 106 industrial sectors included in the ONS UK 'input-output' table, taking into account the business of each supplier. This breakdown was then combined with ratios taken from that table – a matrix of transactions between UK-based industries, with imports separated out – to arrive at the final split in the value of Huawei's initial purchases between UK GDP by sector, content ultimately imported, and UK sales taxes. The calculation effectively takes into account all 'rounds' of transaction in Huawei's UK-based supply chains. The regional split combines data on spending by supplier postcode with estimated regional input-output tables, with the latter arrived at by combining the UK input-output table with data on regional GDP ('GVA') by broad industry.	**Huawei:** Purchases from other UK-based businesses, by individual supplier, with postcode. **ONS:** United Kingdom Input-Output Analytical Tables (consistent with UK National Accounts Blue Book 2013). Regional GVA NUTS 1, table 1.3 (region by industry), December 2014.
Employment	Each industry's indirect GDP is divided by its productivity, as measured by total GDP per workforce job. The latest available dataset on GDP by detailed sector, for 2014, was used. Workforce jobs at the detailed level were estimated by taking data on jobs at the broad industrial sector level for 2014, and splitting the totals into the more refined industrial sectors taking into account detailed business employee numbers for 2013 from the latest Annual Business Survey. The regional split takes into account productivity by region and industry, arrived at by combining data on GDP by region and industry with data on jobs by region and industry.	**ONS:** GDP low level aggregates 2014, April 2015. Employee and self-employed jobs by industry (table 'JOBS 02') and by region and industry ('JOBS 05'), March 2015. Annual Business Survey – 2013 provisional results, November 2014.
Taxation	The indirect tax calculation sums up over the following taxes: • Taxes on products and production, based on the ratio of these taxes to total GDP for each sector in the input-output table. • Corporation tax paid by firms in the supply chain, estimated by combining the share of each industry's profits in GDP[17] with the ratio of corporation tax to profits for each broad industry using HMRC data. • Employers' national insurance and employees' income tax and national insurance, estimated for each industry taking into account features of the tax and NIC systems for the 2014/15 tax year, average pay in each industrial sector[18] and the distribution of pay across the economy.[19] • For the regions, indirect taxes were split in proportion to indirect GDP, but with income tax and employee NICs adjusted to take into account the impact of higher average wages in London than elsewhere.	**HMRC:** Official Statistics table 11.5, computation of corporation tax liability, by industry, financial year ending 2013, August 2014. Overview of Tax Legislation and Rates, March 2014. **ONS:** Annual Survey of Hours and Earnings (ASHE), 2014 provisional results, tables 5 (UK and regional earnings) and P10 (employer pension contributions).

17 The share of each industry's profits in GDP was estimated by taking the ratio of 'gross operating surplus' to GDP from the input-output table, and deducting the share plausibly relating to self-employed income rather than corporate profits, taking into account ratios of self-employed to employee jobs by industry.

18 Average pay for each sector is calculated to be consistent with the GDP composition and jobs data already implicit in the calculations. Indirect GDP for each industry is scaled by the share of employee compensation in GDP in the input-output table, with this share scaled up to include self-employed earnings and adjusted down to allow for employer national insurance and pension contributions included in employee compensation. The result is divided by indirect workforce jobs for the sector as already calculated. The adjustment for pension contributions is based on 'ASHE' data for the whole economy.

19 The tax and national insurance revenue totals are first calculated by applying the systems' rates and thresholds to average pay for each industry. These totals are then adjusted by factors calculated to reflect the impact of the distribution of pay around the average, based on the distribution of gross annual pay across the economy.

Effect type	Basis of calculation	Sources
Induced effects		
GDP	Induced GDP is calculated in two parts, that derived from spending by employees in the supply chain, and that derived from spending by Huawei employees. For the supply chain workers, disposable earnings are derived by taking the total wage bill of each industrial sector in the supply chain (scaled up to include the self-employed) and deducting income tax and national insurance contributions – these elements having already been calculated to arrive at the indirect tax take. We assume that all of this disposable income is spent. The initial spending by supply chain workers is combined with information in the input-output matrix – including household spending by product as well as intra-industry transactions in this case – in order to arrive at the induced GDP impact. The spending power of Huawei staff is worked out from the information supplied by the company on its employees' take-home pay. This is converted into a GDP impact by using the same ratio as found for spending by supply chain employees.	**ONS:** *As for 'indirect' calculation.* **Huawei:** Data on employees' take-home pay (by postcode of employee).
Employment	The induced jobs impact is derived by applying, to each industry, the GDP-to-jobs ratios already worked out. The regional split in induced jobs is derived from the regional split in induced GDP, using the region-by-industry productivity numbers already calculated.	**ONS:** As for 'indirect' calculation.
Taxation	The induced tax impact is calculated by summing over the following elements: • Taxes on products, taxes on production and corporation tax paid by businesses in the consumer supply chain, calculated on the same basis as for the indirect tax contribution. • Employers' national insurance and employees' income tax and national insurance, paid by staff and firms in the consumer supply chain, calculated on the same basis as for the indirect tax contribution. • Taxes on sales (such as VAT and excise duties) relating to household spending of Huawei staff and of workers in the Huawei and consumer supply chains. This is calculated by combining average take-home pay in each industry (or of Huawei staff) with consumer-tax-to-disposable-income ratios based on official data, multiplied by the number of employees in each case.[20] The regional split is in line with the regional split in induced GDP, but with employee income tax and NICs adjusted for London in the same way as for the indirect tax contribution.	**HMRC and ONS:** *As for 'indirect' calculation.* **ONS:** The effects of taxes and benefits on household income, 2012/13, June 2014, table 16A.

20 The ratio of taxes on final household consumption of goods and services to disposable income is calculated on the basis of this data for the five income quintiles, with the appropriate ratio then applied to each industry based on the disposable income quintile that that industry's average after-tax pay falls into.

OXFORD
Abbey House, 121 St Aldates
Oxford, OX1 1HB, UK
Tel: +44 1865 268900

LONDON
Broadwall House, 21 Broadwall
London, SE1 9PL, UK
Tel: +44 207 803 1400

BELFAST
Lagan House, Sackville Street
Lisburn, BT27 4AB, UK
Tel: +44 2892 635400

NEW YORK
5 Hanover Square, 19th Floor
New York, NY 10004, USA
Tel: +1 (646) 786 1879

PHILADELPHIA
303 Lancaster Avenue, Suite 2e
Wayne, PA 19087, USA
Tel: +1 (610) 995 9600

BOSTON
51 Sawyer Rd
Building 2, Suite 220
Waltham, MA 02453
Tel: +1 (617) 206-6112

SINGAPORE
Singapore Land Tower, 37th Floor
50 Raffles Place
Singapore 048623
Tel: +65 6829 7068

PARIS
9 rue Huysmans
75006 Paris, France
Tel: +33 1 45 49 60 85

FRANKFURT
Mainzer Landstraße 41
60329 Frankfurt am Main
Germany
Tel: +49 69 95 925 280

SYDNEY
Level 4, 95 Pitt Street
Sydney, 2000
Australia
+61 (0)2 8249 8286

email: mailbox@oxfordeconomics.com

www.oxfordeconomics.com

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OXFORD ECONOMICS