OXFORD ECONOMICS

HUAWEI

THE ECONOMIC IMPACT OF HUAWEI IN THE UK

NOVEMBER 2020


HUAWEI
HUAWEI

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EXECUTIVE SUMMARY

Huawei is a global leader in information and communications technology solutions. It provides a wide range of networks, transmission products with solutions, telecommunications equipment and related services, and smart phones and other consumer products. It has operations across the UK and makes a substantial and important contribution to the UK economy through jobs, GDP and tax receipts and via its research collaborations and training.

£3.3 billion

Total contribution to UK GDP supported by Huawei in 2019.

This study is the third in a series that looks at its economic impact on the UK and provides a timely update on the company's contribution. It looks at the impact of Huawei's business activity on employment, GDP, and taxes paid in the UK. The results presented in this study are on Huawei's economic impact on the UK over the five years from 2015 to 2019.

It goes further than the previous two studies by looking in greater depth at the company's impact on the UK's regions and countries. It also uses a slightly different methodology than the previous two UK studies, as it is part of wider European research. It therefore seeks to quantify the impact of Huawei's spending across Europe on the UK. This enables us to see how Huawei's activities in Germany, for example, trigger activity in the supply chain in the UK.

Previous studies have just focused on the company's operations and spending effects in the UK. As a result of capturing more of Huawei's impact on the UK economy, the results are larger and should not be compared directly to previous studies.

51,000

UK jobs supported by Huawei's activities in 2019, including via its supply chain and consumer spending impacts.

HUAWEI'S TOTAL ECONOMIC IMPACT IN 2019

The calendar year 2019 was a very good one for Huawei in the UK. On the network side, it won contracts with three out of the four mobile phone networks in the UK to supply equipment to support their infrastructure and increased sales of fibre broadband equipment. On the consumer side, it launched its P30 Pro handset and a wide range of new PCs, tablets, wearables and headphones to diversify its range. It gained market share and became a more effective competitor in the consumer electronics market. It also opened a new office in Manchester and a new training centre in Birmingham to boost 5G ICT engineering skills.

In 2019, Huawei supported a £3.3 billion contribution to UK GDP. Some £328 million of this was generated by the firm's own operations (its 'direct impact'). We estimate the company's worldwide procurement from European suppliers stimulated a £1.7 billion contribution along its UK supply chain (its 'indirect impact'). The payment of wages by Huawei and its European suppliers is estimated to have supported £1.4 billion in GDP in the UK consumer economy (its 'induced impact').

Huawei also had a sizeable impact on the labour market. We estimate the company supported 51,000 jobs in the UK in 2019. Some 28,700 of these were stimulated by the company's European procurement and 20,700 in the consumer economy, by the payment of wages by Huawei and its European suppliers.

Huawei is estimated to have supported £1.1 billion in tax receipts for HM Exchequer in 2019. This would be sufficient to fund the annual salaries of 30,400 teachers in UK schools.

£1.1 billion

Huawei supported £1.1 billion in tax revenues for the Exchequer in 2019.

HUAWEI'S IMPACT HAS GROWN OVER THE LAST FIVE YEARS

Huawei's contribution to the UK economy has grown substantially between 2015 and 2019. The GDP the company is estimated to have supported has increased from £1.2 billion in 2015 to £3.3 billion in 2019 (in real terms), an increase of over 180%. This is significantly above the growth in the whole economy as measured by UK GDP, which rose by just 6% over the same time interval. Most of the stimulus to Huawei's impact on UK GDP has come from the economic activity it stimulated along its UK supply chain and through increased wage-consumption impacts—workers spending their wage income on goods and services in the UK economy—up £1.1 billion and £0.9 billion, respectively.

180%

The UK GDP supported by Huawei rose by 180% in real terms between 2015 and 2019.

The impact Huawei has on the UK labour market has doubled between 2015 and 2019. The number of jobs the company is estimated to have supported has increased from 25,500 to 51,000. As with GDP, most of the growth in employment has occurred through increased procurement from its UK supply chain and through wage-financed consumption. But the company's own employment also increased by 14% over the same period.

The amount of tax receipts Huawei's activities supported increased by over 160% or £690 million between 2015 and 2019. As for the other two metrics, most of the increase occurred through indirect and induced impacts, but Huawei's own tax payments are estimated to have doubled over the period.

Fig. 1: Huawei's total economic impact, 2015-2019

£ million (2019 prices)	2015	2016	2017	2018	2019	Average annual growth % (2015-2019)
Direct GVA	165.0	295.9	286.0	332.6	328.2	18.8%
Indirect GVA	542.5	868.2	993.8	1,378.6	1,662.7	32.3%
Induced GVA	485.9	777.6	864.8	1,148.3	1,353.5	29.2%
Total GVA impact	**1,193.4**	**1,941.7**	**2,144.7**	**2,859.5**	**3,344.4**	**29.4%**
Employment	**2015**	**2016**	**2017**	**2018**	**2019**	**Average annual growth % (2015-2019)**
Direct employment	1,400	1,700	1,700	1,600	1,600	3.4%
Indirect employment	13,500	18,200	17,400	22,200	28,700	20.7%
Induced employment	10,600	14,400	13,400	16,300	20,700	18.2%
Total employment impact	**25,500**	**34,300**	**32,500**	**40,100**	**51,000**	**18.9%**
£ million (2019 prices)	**2015**	**2016**	**2017**	**2018**	**2019**	**Average annual growth % (2015-2019)**
Direct tax payment	97.6	144.6	150.8	183.8	159.3	13.0%
Indirect tax payment	153.7	246.4	281.9	390.2	476.3	32.7%
Induced tax payment	172.8	277.3	306.0	406.0	477.6	28.9%
Total tax payment	**424.1**	**668.3**	**738.7**	**980.0**	**1,113.2**	**27.3%**

Source: Huawei; Oxford Economics

HUAWEI'S IMPACT IS FELT ACROSS THE UK'S NATIONS AND REGIONS

Huawei's economic contribution was spread across the UK's regions and countries. In 2019, 28.9% of the £3.3 billion contribution to UK GDP (equal to £966 million) occurred in London where Huawei Global Finance and five other of its offices were located. A further £711 million (or 21.2%) was supported in the South East, where its head office in Reading was sited. An additional £391 million (or 11.7%) was supported in the East of England, where Huawei had three research facilities in Cambridge and Ipswich.

Analysing Huawei's impact relative to the size of the region's or country's economy, in 2019 the company had the largest impact in the South East, where it supported 0.25% of the region's GDP in 2019. Its next largest relative impact was seen in the East of England, where the company supported 0.23% of the region's GDP.

Employment at Huawei and the jobs it supports through its European procurement and payment of wages were also widely dispersed around the UK. Some 12,500 (or 24.5%) of the 51,000 jobs Huawei supported in the UK in 2019 were located in London. A further 9,700 (or 19.0% of the total) were situated in the South East, with 6,700 jobs (or 13.1% of the total) located in the East of England.

Huawei had the biggest relative impact on the labour market in London and the East of England where it supported 0.21% of all employment. This was closely followed by the South East, where it supported 0.20% of all jobs.

6 sites

Huawei currently employs 510 engineering staff across its six UK R&D sites.

HUAWEI HELPED TO BOOST THE UK'S PRODUCTIVE POTENTIAL

Huawei has also supported a wider, 'catalytic' contribution to the UK economy through its spending on R&D, internal training, and external training to upskill the UK labour force. This in turn contributes to the increase in the productive capacity of the economy. In 2019, Huawei undertook R&D at six sites across the UK. Huawei also undertook R&D partnerships with more than 30 UK universities. In 2019, it held technology-based workshops, developed and ran joint labs with its partner universities, and provided resources to help strengthen the universities' research teams.

In 2019, Huawei spent £1.1 million on vocational training to upskill its own staff. Some of this was classroom based training through what is called Huawei University (usually located at the company's offices in Germany or China). This focused on technical or managerial skills. There are also a wide range of online courses which range in subject matter from compliance issues to project management and functional courses.

Huawei also contributed to the skillset available in the wider UK economy through its provision of external training. In 2019, Huawei opened the 5G Birmingham Training Centre offering 5G training to its business partners' engineers. The company's ICT Academy and 'Learn-on' programme provide free online technology courses and digital skills training. Huawei also sent 50 STEM (Science, Technology, Engineering & Maths) undergraduates from leading UK STEM universities to China as part of its 'Seeds for the Future' programme.

582

Number of UK students who benefitted from Huawei's ICT Academy programme in 2019.

In all these ways, Huawei has made a substantial contribution to the UK economy over the last five years by supporting thousands of jobs and creating extra revenue for the Treasury as well as adding to the country's skills base and R&D base.

HUAWEI'S ECONOMIC IMPACT IN 2019

● Direct ● Indirect ● Induced ● Total

CONTRIBUTION TO GDP

£328 million

£1,663 million

£1,354 million

£3,344 million

0.1% of UK's total GDP

EMPLOYMENT

1,600 jobs

28,700 jobs

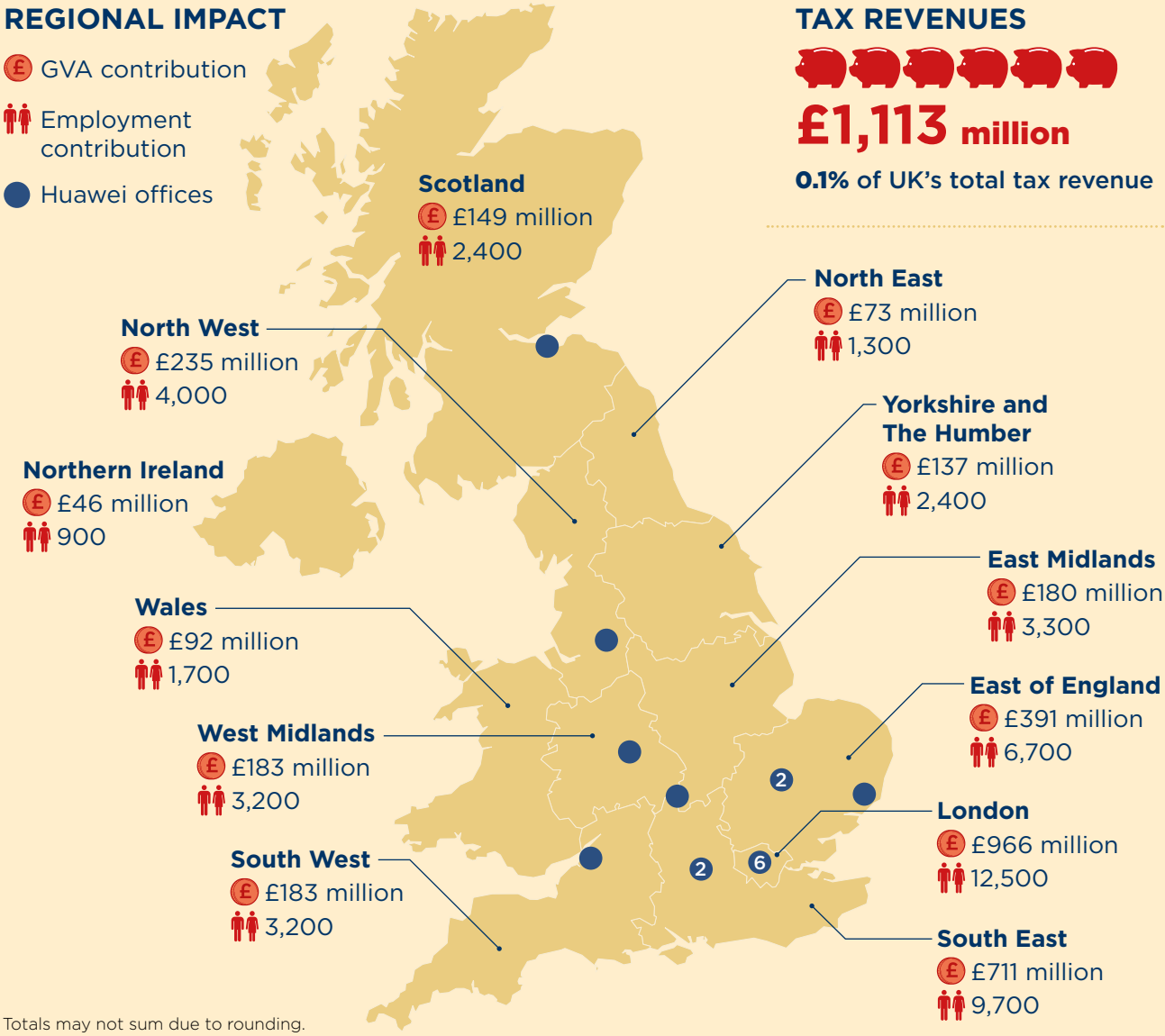
20,700 jobs

51,000 jobs

0.1% of UK's total employment

REGIONAL IMPACT

- £ GVA contribution
- Employment contribution
- Huawei offices



TAX REVENUES

£1,113 million

0.1% of UK's total tax revenue

Totals may not sum due to rounding.


HUAWEI

1. INTRODUCTION

Huawei is a global corporation spearheading the design, manufacture and installation of advanced telecommunications infrastructure and smart devices around the world. It has had a presence in the UK since 2001, and its operations in the country have subsequently expanded significantly, spreading out around the UK's regions and countries. This report explores the significant benefits generated for the UK economy by the company's activities in 2019—the most recent period for which robust data are available, and the most recent year of 'normal' economic activity, unaffected by the coronavirus pandemic.

The study can be viewed in general terms as an update to the report published in 2019.[1] However, the results in this report also form part of a wider project, concerned with Huawei's impact right across Europe. A slightly different approach has therefore been taken to parts of the analysis, giving a fuller picture of Huawei's economic impact in the UK, but meaning that the estimates presented here are not strictly comparable to those in the previous study.

Two dimensions of Huawei's economic impact are covered, namely the 'demand-side' support provided directly and indirectly to UK production in 2019, and the 'supply-side' contribution to the nation's future productive capacity—through its investment in skills, and research and development (R&D). These two dimensions of Huawei's economic benefits are introduced in turn here.

[1] Oxford Economics. 2019. *The Economic Impact of Huawei in the UK*.

1.1 DEMAND-SIDE SUPPORT FOR UK PRODUCTION IN 2019

As explained in Box 1, the short-term demand-side impact on the economy captures the support provided to UK GDP, jobs and tax revenues in 2019, by Huawei's own activities, supply chain and wage-financed consumption impacts. Here, it is worth noting in particular that the support provided to the UK supply chain (the so-called 'indirect' effect), as captured by this analysis, encompasses three sources of demand:

1. Purchases from UK suppliers by Huawei's UK-based subsidiaries,
2. Purchases from UK suppliers by Huawei's global headquarters in Shenzen.
3. Purchases from UK suppliers by Huawei's operations in 11 European countries, plus purchases by other businesses in Europe where those inputs feed into supplies ultimately purchased by Huawei's worldwide operations.

While the 'indirect' impact in the 2019 report reflected the two most significant sources of demand—i.e. points (1) and (2) above—the third source could not be captured in that single-country study. But it has been captured this time around, as the present study forms part of a wider piece of analysis.[2] We also include the wage-financed consumption of the workers whose jobs depend on Huawei procurement detailed above.

This analysis also explores the support provided to the regional economies of the UK. It quantifies the economic contribution Huawei made to the UK's four countries and the nine English regions.

Huawei's contribution to the UK Government's regional 'levelling up' agenda will be enhanced in the near future, as the full effects of two recently-opened Huawei facilities—an office in Manchester and a training facility in Birmingham—are felt. These facilities will not have fully influenced the regional distribution of activity illustrated in this report, relating to 2019, but can be expected to increase the share taken by the North West and West Midlands regions, relative to that taken by London, the South East, and East of England, going forward.

More specifically, the new office is based in the Regus City area of Manchester (see Box 2). It will eventually house several of Huawei's key business operations including customer account teams, the Huawei Network Design Centre and Huawei's Delivery Operations Center for the north of the UK. Huawei has quickly recruited over 50 mainly local individuals, to work at the base since it opened in October 2019.[3]

A more modest number of Huawei staff are now located at the new Birmingham 5G training centre (see Box 3), but the main point of that is to offer short courses relevant to telecommunications engineers.[4] Participants will be individuals working for Huawei's carrier customers and third party employers. With the capacity to train up to 400 individuals per year, the benefit to the skills of the local, regional and national telecommunications sector workforce will be substantial.

These new facilities are in addition to the sites already operated by the corporation's three UK-based subsidiaries, namely Huawei Technologies (UK), Huawei Technologies Research and Development (UK), and Huawei Global Finance (UK). These subsidiaries have their headquarters at Reading, Cambridge and London respectively, but also run 15 further sites around the country, in addition to the new Manchester and Birmingham sites.

On top of all of this, Huawei has just started to develop another major R&D and manufacturing facility in Cambridge. Once the £1 billion investment in the first phase of the development has been made, the main focus of activity there will be on the design and production of optoelectronics goods. An additional 400 jobs are expected to be located there as a result of this first phase alone.

[2] Oxford Economics. 2020. *The Economic Impact of Huawei in Europe.*
[3] Huawei. 2019. *Huawei Opens New Office in Greater Manchester – Major Boost to Northern Powerhouse Tech Economy.*
[4] Huawei. 2019. *Huawei Opens New Training Centre in Birmingham – Investing in Engineering Talent.*

BOX 1: INTRODUCING ECONOMIC IMPACT ANALYSIS

The impact of Huawei's operations is assessed using a standard means of analysis called an economic impact assessment. This involves quantifying the impact of three types of expenditure undertaken by Huawei (summarised in Fig. 2, overleaf):

- **Direct impact** relates to the operational expenditure Huawei undertakes running its own activities. It encompasses the economic activity and employment generated at its Reading headquarters and 16 other sites across the UK;
- **Indirect impact** is the economic activity and employment stimulated along its UK supply chain by Huawei's global operations' procurement of inputs of goods and services from European suppliers;
- **Induced impact** comprises the wider economic benefits that arise in the UK from the payments of wages by Huawei and the firms in its supply chain to their own European-resident employees. It includes wage-financed consumer spending by UK-residents, European-residents' tourist spend in the UK and any spend on UK-made goods and services by European-residents.

The sum of these channels makes up the total of Huawei's expenditure impacts.

The results are presented on a gross basis. They therefore ignore any displacement of activity from Huawei's competitors or other firms in the UK. Nor do we consider what the resources currently used by Huawei or stimulated by its expenditure could alternatively produce in their second most productive usage.

Huawei's economic contribution is measured using three metrics:

- **GDP**, or more specifically, the *gross value-added (GVA)* contribution to GDP;[5]
- **Employment**, measured on a headcount basis; and
- **Tax revenue** flowing to the UK government.

The expenditure impact modelling is conducted using a global Input-Output (I-O). This model was constructed by Oxford Economics, using data published by the Organisation for Economic Co-operation and Development (OECD) for 2015.[6] Further detail about the economic impact methodology is included in Appendix 1.

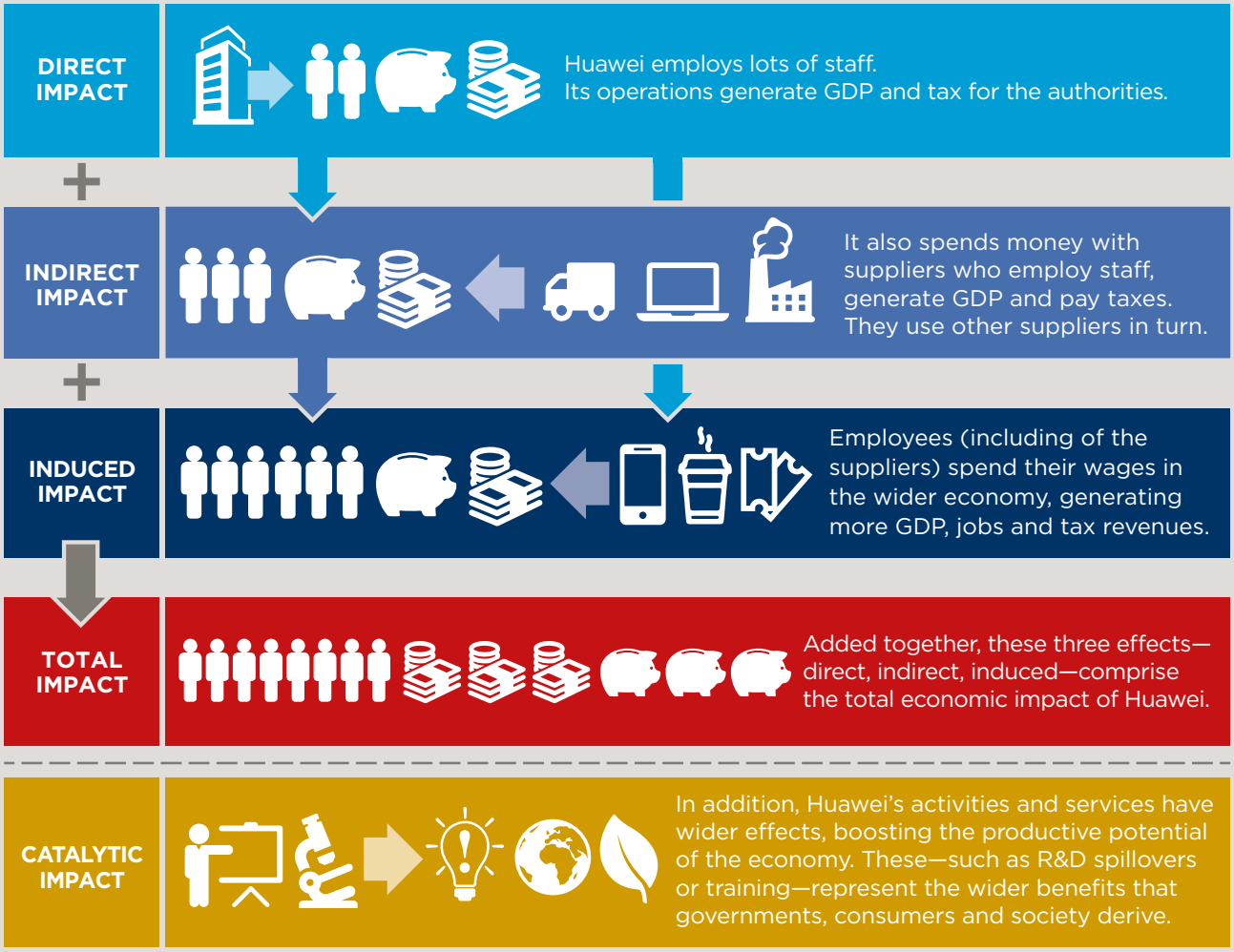
Lastly, the analysis examines Huawei's ***catalytic impacts***. These are the impacts the company has on the productive potential of the UK economy. These occur through the training and other investment in the staff's and others' human capital which boosts their productivity. It also includes the company's expenditure on R&D, which drives improvements in organisation and methods of production, and develops new products and services. These are largely treated in a qualitative way and cannot be added to the expenditure impacts summarised above.

The report does not seek to quantify the economic impact of the nation's digital infrastructure of which Huawei's equipment forms a vital part.

[5] The gross value-added contribution to GDP is defined as the value of the output produced minus the expenditure on inputs of bought in goods and services used up in the production of that output. GDP measures the total economic output of the country. It is used to judge the rate of growth of the economy and to define whether it enters a recession. GDP equals the sum of gross value added plus taxes minus subsidies on production.

[6] OECD. 2018. *OECD Inter-Country Input-Output (ICIO) Tables*.

Fig. 2: Schematic of Huawei's economic contribution to the UK economy



1.2 IMPROVING THE UK ECONOMY'S FUTURE PRODUCTIVE CAPACITY

Huawei also contributes to the UK economy through boosting its productive potential. It does so through its investment in skills and human capital, and investment in research and development (R&D).

In terms of training Huawei's own staff, the company runs the Huawei University scheme, offering in-person training to employees based around the world at its offices in China, Germany, and other locations as well as online courses. But it also offers training and work experience to non-employees, most notably:

- The Huawei ICT Academy's programme for colleges, universities and their students. In 2019, nearly 600 UK-based students have benefited from the Academy's courses in a range of ICT-related subjects such as cloud computing, cyber security, big data, and artificial intelligence. In 2020, Huawei gave free access to some of its ICT Academy courses to anyone in the UK, with the launch of the Learn On programme, to boost ICT skills in the face of the coronavirus pandemic.
- The Seeds for the Future programme aimed at students of STEM subjects. In 2019, this scheme enabled 50 UK undergraduates to benefit from the four-week, China-based residential training and work experience programme.

Turning to the impact of past, ongoing and future research and development, individual UK consumers can now benefit from the 2019 launch of several new innovative products, most notably the P30 Pro mobile phone handset, but also a wide range of new PCs, tablets, wearables, and headphones, which has diversified the range of Huawei products on offer to UK residents. The recent expansion of Huawei into the UK market has further benefited consumers by challenging the previous duopoly of Apple and Samsung in the market for smartphone handsets and devices.

Meanwhile, research into the development of further new products—in the consumer, business, and infrastructure fields—remains of critical importance to Huawei in the UK, with the company continuing to make significant outlays at its centres in Cambridge and elsewhere. As explained in Chapter 3, the potential benefits of spending of this nature will not be confined to Huawei alone, but can also be expected to accrue to other UK businesses of many kinds. This reflects the associated 'knowledge-sharing' possibilities, as well as the eventual opportunity to benefit from new technological advances.

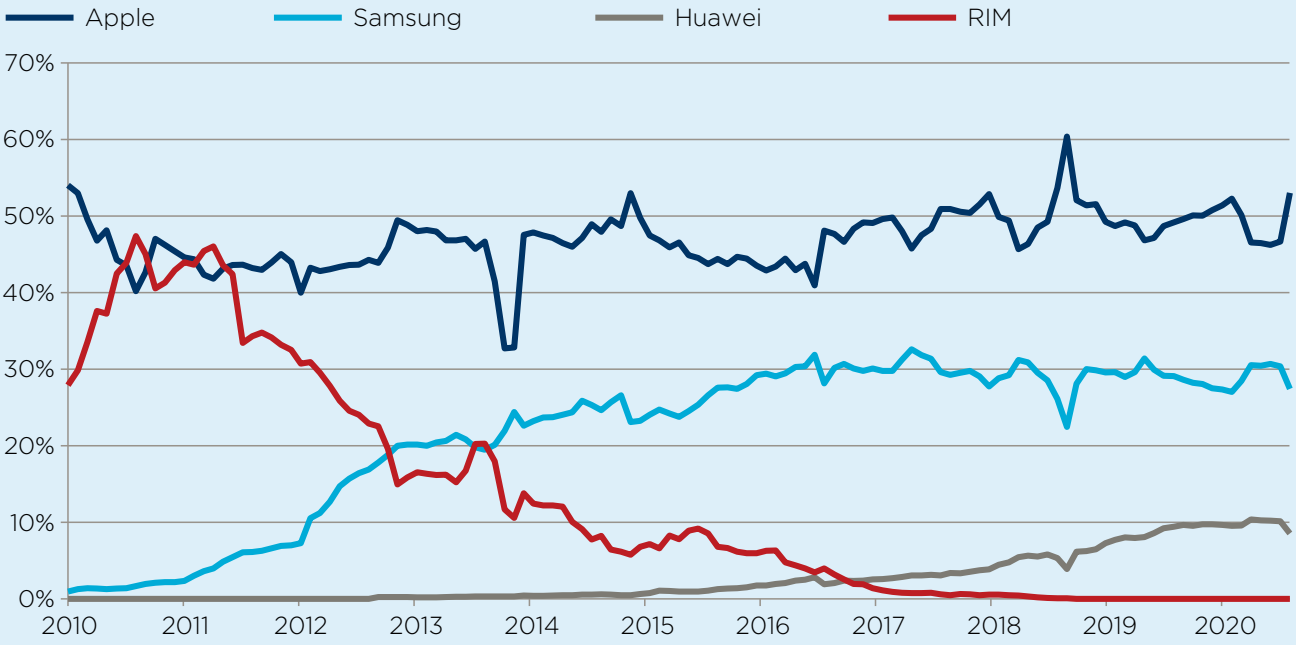
BOX 2: HUAWEI INCREASED COMPETITION IN THE UK SMARTPHONE AND OTHER CONSUMER ELECTRONICS MARKET IN 2019

Huawei consumer products had a very good year in 2019. The company launched its flagship P30 Pro smartphone in the UK in March 2019. This was able to compete with Apple's and Samsung's top of the range Smartphones. The company also launched a range of new PCs and tablets, wearables including the Watch GT and wristbands, and headphones into the UK market.

According to data published by Statcounter, Huawei's market share of mobile device sales in the UK rose to an average of 8.2% in 2019, up from 4.8% in the previous year. This is the first time a provider other than Apple and Samsung has had such a large market share since RIM in 2014.

The presence of a third sizeable player in the consumer mobile devices market in the UK should boost competition. It will increase the choice of products available and should enhance downward pressure on prices in the market, both of which benefit potential customers. In the longer run, it may also foster enhanced R&D and innovation, as the three firms try to attract customers with new features and capacity in their mobile products. Additional competition in the market for consumer devices also brings benefits for the network carriers. They benefit from the increased product offering to customers, and the reduction in leverage for each of the manufacturers.

Fig. 3: Selected mobile vendors' market share in the UK



Source: Statcounter Global Stats

2. HUAWEI'S ECONOMIC IMPACTS IN THE UK

This chapter analyses the economic contribution supported by Huawei in the UK in 2019. In particular, it details the gross value added contribution to GDP, employment and tax payments supported by Huawei. The results are first presented for the UK as a whole, then broken shown for the UK's countries and the nine English regions.

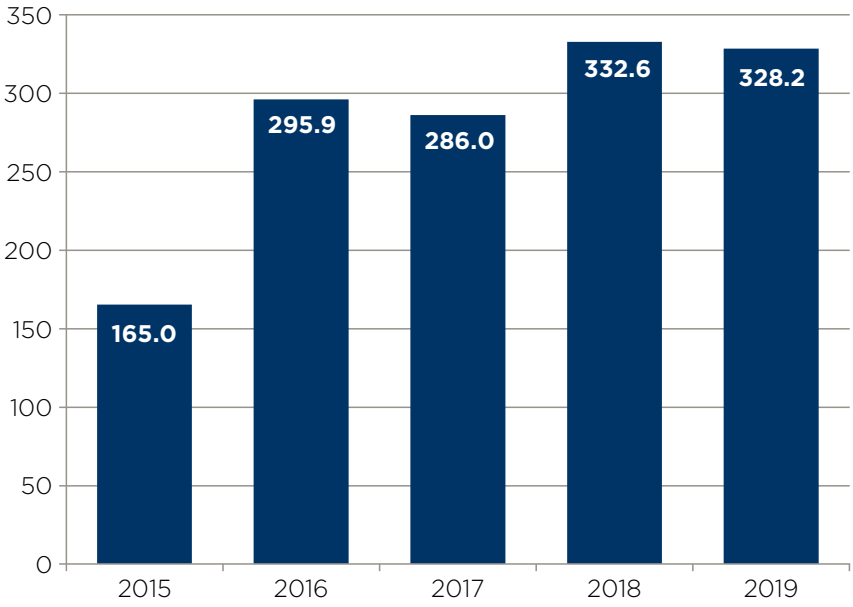
2.1 DIRECT EFFECTS ARISING FROM HUAWEI'S ACTIVITIES IN THE UK

At its 18 offices across the UK, Huawei's staff generate gross value added which contributes to UK GDP. We estimate Huawei's GVA contribution through the 'income approach' to national accounting. Huawei's GVA is therefore measured as the sum of the employee compensation it pays (wages and salaries, employee and employer National Insurance Contributions and pension contributions), its gross operating surplus (as measured by the company's earnings before interest, taxes, depreciation and amortisation (EBITDA)) and its payment of business rates.

In 2019, Huawei generated a £328.2 million GVA contribution to UK GDP (Fig. 4). This is nearly double the figure in 2015, where Huawei contributed £165.0 million (in 2019 prices).[7] This represents an average annual growth rate of 18.8%.

Fig. 4: Huawei's annual contributions to UK GDP, 2015-2019

£ million (2019 prices)

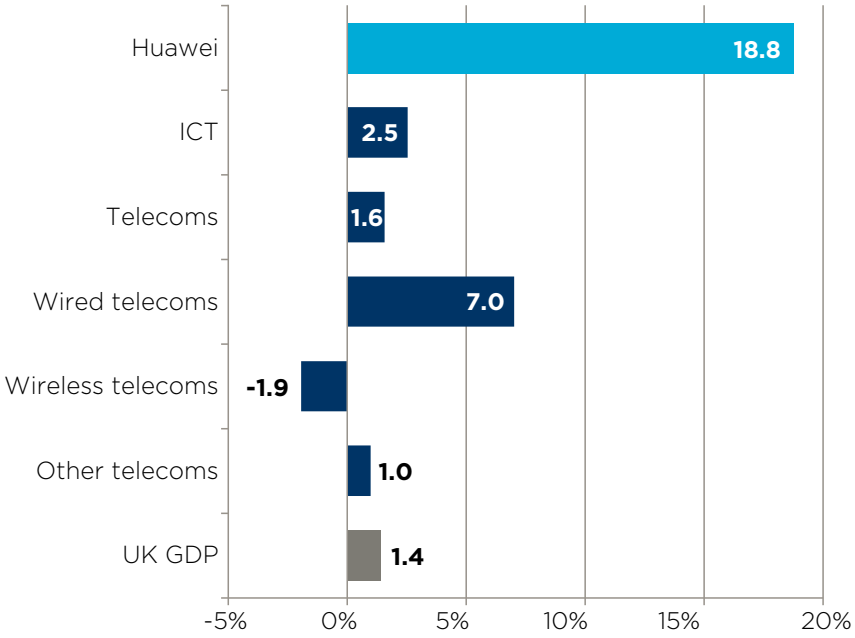


Source: Huawei; Oxford Economics

[7] All figures are a given in 2019 prices and comparisons are measured in real terms.

The growth in Huawei's contribution to GDP is particularly notable when compared to the rest of the sector in which it operates (Fig. 5). Huawei's growth rate is much higher than the average annual growth rate seen in the ICT sector (2.5%) and the telecommunications sector (1.6%).[8] Even the highest growing component of the telecommunications sector in the UK, the wired telecommunications sector, has only increased its contribution by an average of 7.0% a year, less than half that of Huawei. The company also has a remarkably high growth rate when compared to the rest of the economy, UK GDP grew at an average annual rate of 1.4% between 2015 and 2019.[9]

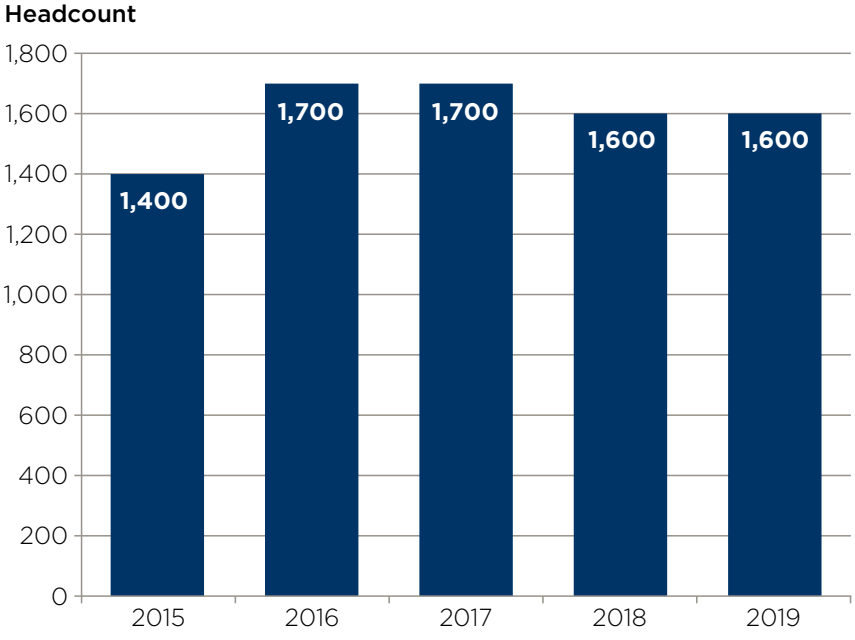
Fig. 5: Compound annual growth rate in real GDP between 2015 and 2019



Source: Huawei; ONS (2020); Oxford Economics

This high contribution to UK GDP is generated by Huawei's staff. In 2019, Huawei employed 1,600 employees in its UK operations, up 200 since 2015 (Fig. 6). This represented an average annual growth rate of 3.4%.

Fig. 6: Huawei's own employment at its UK operations, 2015 to 2019

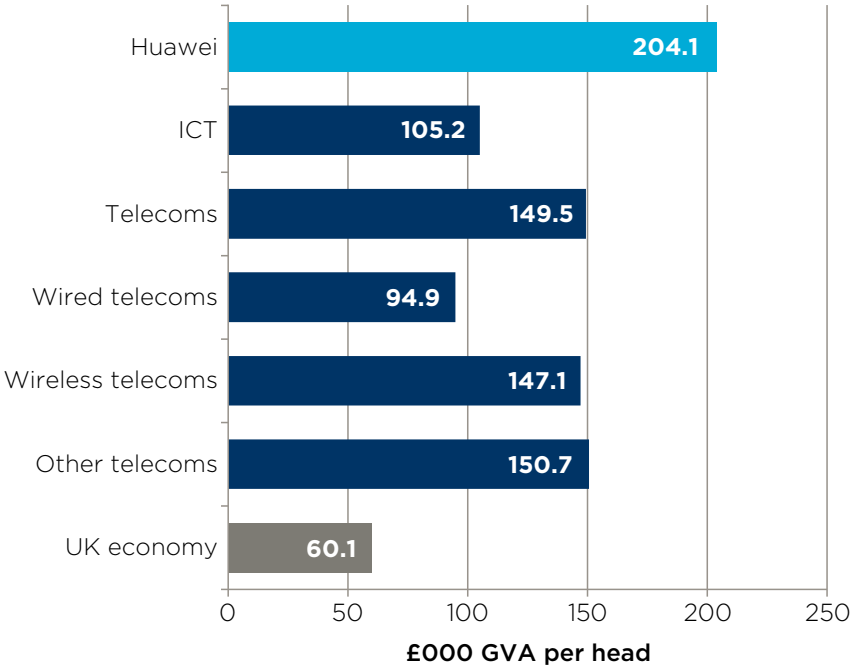


Source: Huawei

[8] ONS. 2020. *Annual Business Survey - 2018 Revised Results.*
[9] ONS. 2020. *GDP First Quarterly Estimate, UK: April to June 2020.*

The large rise in Huawei's contribution to GVA relative to the rise in its staff implies that Huawei's labour productivity has increased over time. Between 2015 and 2019, Huawei's labour productivity (measured as GVA per worker) increased by 14% on average per year. We estimate that in 2019, the average productivity of a Huawei worker was £204,100 (see Fig. 7). Compared to other sectors in the UK economy, this is very high. The latest data (for 2018) shows the average productivity of a worker in the telecommunications sector was £149,500, whilst it was £105,200 in the ICT sector.[10] Huawei is also extremely productive when compared to the UK economy, where the average worker contributes £60,100.

Fig. 7: Huawei's labour productivity compared to the wider information and communication sector, and UK economy

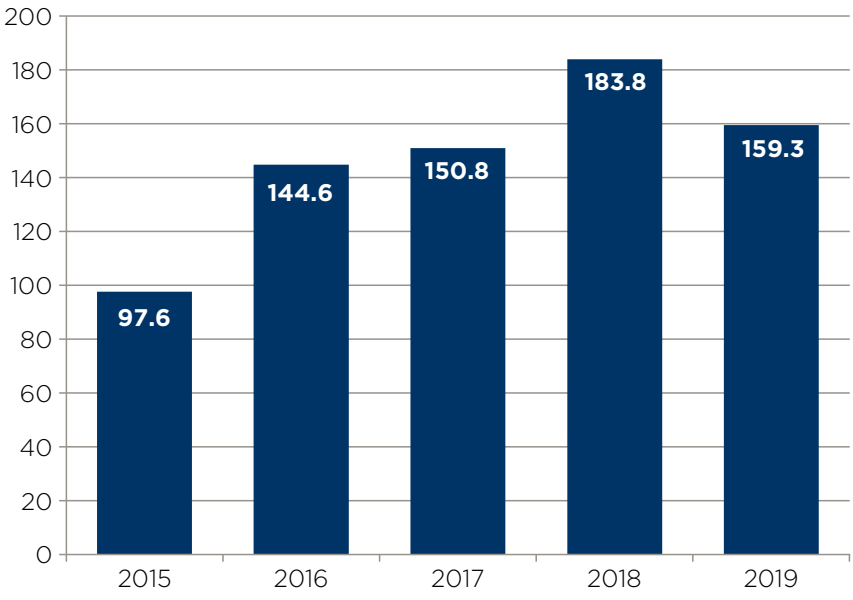


Source: Huawei; ONS (2020); Oxford Economics

Huawei also makes a large contribution to taxes. In 2019, Huawei and its employees paid £159.3 million in taxes to the UK Exchequer (see Fig. 8). Compared to the £97.6 million paid by Huawei in 2015, this represented an average annual rise of 13% in real terms. In 2019, the £159.3 million paid in taxation was roughly equivalent to the annual salaries of 4,400 teachers in the UK.[11]

Fig. 8: Huawei's tax contribution in the UK, 2015 to 2019.

£ million (2019 prices)



Source: Huawei; Oxford Economics

[10] ONS. 2020. *Annual Business Survey - 2018 Revised Results.*

[11] Based on a gross annual salary in 2019 for a secondary education teaching professional of £36,607. ONS, 2020. *Annual Survey of Hours and Earnings.* Available at: https://www.ons.gov.uk/businessindustryandtrade/business/businessservices/datasets/uknonfinancialbusinesseconomyannualbusinesssurveysectionsas [Accessed: 14 October 2020]

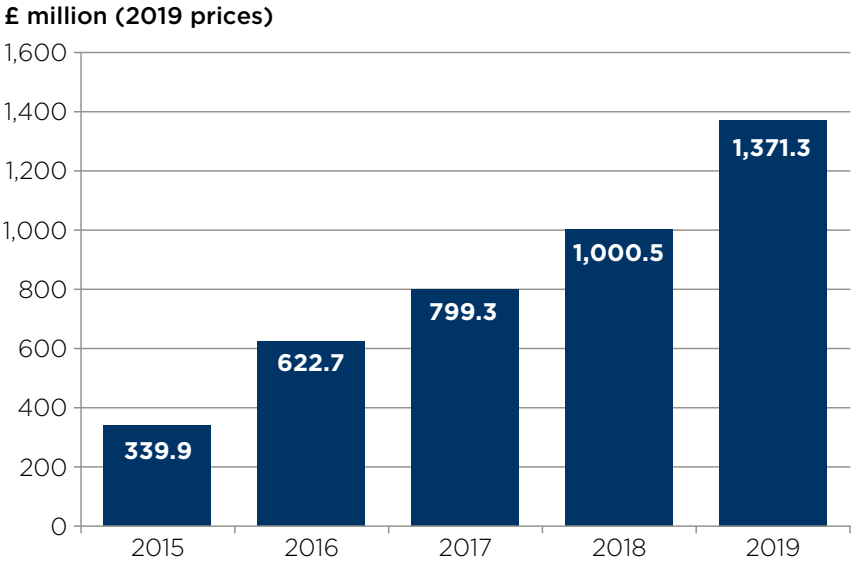
2.2 INDIRECT EFFECTS ARISING FROM HUAWEI'S SUPPLY CHAIN

Huawei's impact in the UK extends past the contribution it makes directly through its own operations. This is because, in conducting its operations both in the UK and across Europe, Huawei procures a range of inputs of goods and services. Over the previous five years, Huawei's own procurement from UK suppliers has totalled £4.1 billion (in 2019 prices). Some 33.2% of this spend on inputs of goods and services made by UK firms or £1.4 billion, occurred in 2019 (Fig. 9).

Through this procurement and its European suppliers' spend on UK-made goods and services, Huawei stimulates economic activity at UK firms, as well as employment and tax payments. This contribution to UK GDP that occurs along Huawei's UK supply chain, known as the indirect channel, has increased substantially over the last five years. In 2019, it was £1.7 billion; this was up from £542.5 million (in 2019 prices) in 2015, corresponding to an average annual rise of 32.3%. The number of jobs supported also rose markedly, from 13,500 to 28,700 between 2015 and 2019 — an average annual growth rate of 20.7%. This economic activity also supported a large rise in tax payments through the indirect channel, from £153.7 million in 2015 (in 2019 prices) to £476.3 million in 2019. This is an average annual rise of 32.7%.

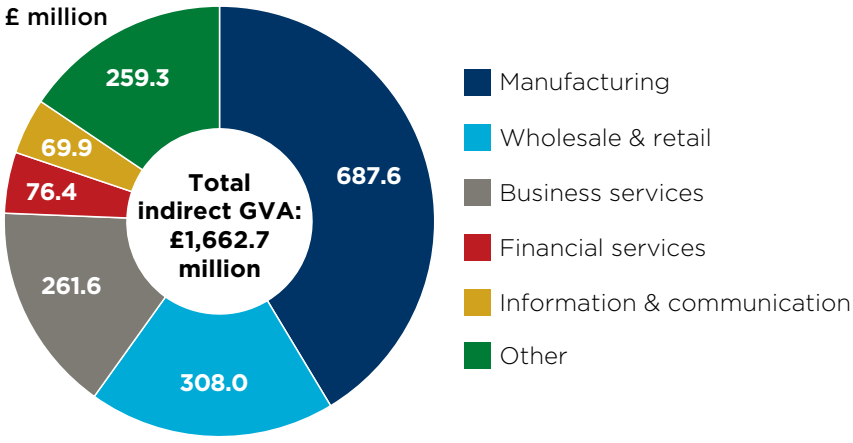
The indirect impact is spread across UK industry (Fig. 10). In 2019, the largest indirect GVA contribution in 2019 was stimulated in the manufacturing sector, at £687.6 million or 41.4% of the total supply chain impact. Other large contributions were supported in the wholesale and retail sector (£308.0 million or 18.5% of total) and business services (£261.6 million or 15.7%).

Fig. 9: Huawei procurement spend from UK suppliers between 2015-2019



Source: Huawei

Fig. 10: Industrial distribution of Huawei's indirect impact on the UK GVA, 2019



Source: Huawei; Oxford Economics

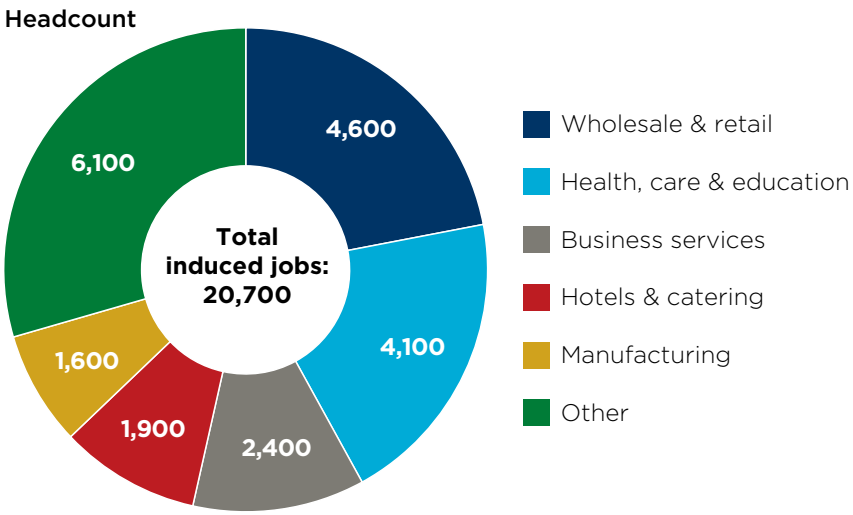
2.3 INDUCED EFFECTS ARISING FROM WAGES BEING SPENT

Between 2015 and 2019, Huawei paid staff across its 18 offices and other operations across the UK an estimated £974.6 million in wages (in 2019 prices). In addition, we estimate that a further £3.9 billion (in 2019 prices) was paid to workers along Huawei's UK supply chain as a result of Huawei's operations procurement across Europe. Some £1.2 billion (28.9%) of the total wage bill estimated to have been paid occurred in 2019. Employees spend their wages at retail, leisure and other outlets. The outlets procure the goods and services they sell from their own supply chains. The economic activity, employment and tax receipts stimulated as result of the wage payments are referred to as the induced channel.

Huawei's induced contribution has grown significantly between 2015 and 2019. Huawei's induced GVA has grown from £485.9 million in 2015 (in 2019 prices) to £1.4 billion in 2019, whilst induced employment has grown from 10,600 to 20,700 over the same period. Induced taxation rose from £172.8 million (in 2019 prices) to £477.6 million between 2015 and 2019. The corresponding average annual growth rates for induced GVA, employment and taxation were 29.2%, 18.2% and 28.9% respectively.

This induced activity impacted virtually every industry across the UK economy in 2019 (Fig. 11). The largest amount of jobs supported by wage-financed consumer spending occurred in the wholesale and retail sector (4,600 jobs or 22.0%). Health, care and education (4,100 or 20.0%) and business services (2,400 or 11.5%) also benefitted significantly.

Fig. 11: Industrial distribution of induced contribution to employment, 2019



Source: Huawei; Oxford Economics

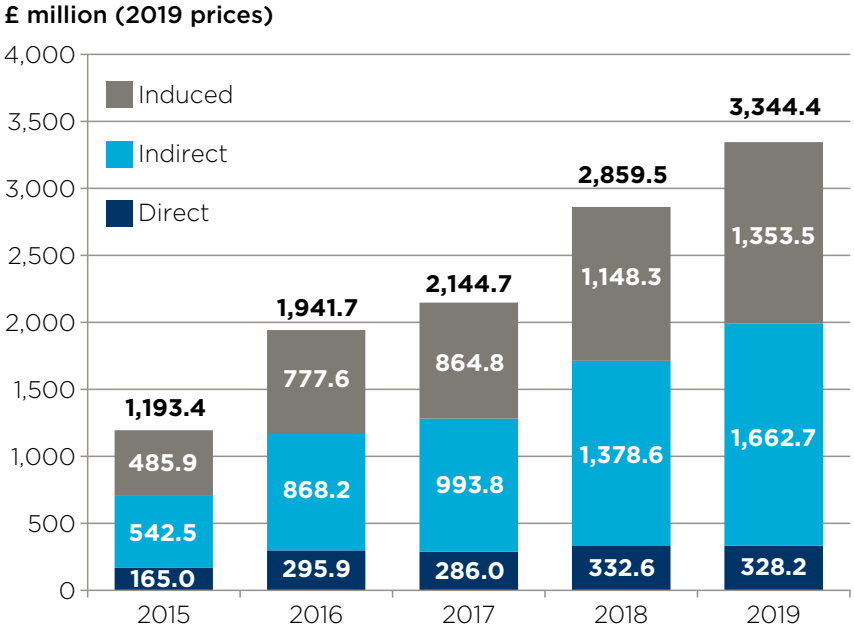
2.4 HUAWEI'S TOTAL EXPENDITURE IMPACTS ON THE UK

Combining the three channels—direct, indirect and induced—we find that Huawei's supported a total GVA contribution to UK GDP of £3.3 billion in 2019 (Fig. 12). Its contribution to economic activity has increased in each year since 2015, at an average annual rate of 29.4%. There was strong growth in all three channels of impact, with an average annual increase of 18.8%, 32.2% and 29.2% across the direct, indirect and induced channels, respectively.

Huawei has also had a sizeable impact on the UK labour market over the same period. We find that the total number of jobs supported across the three channels has risen substantially, from 25,500 in 2015 to 51,000 in 2019 (Fig. 13). This rise was largely driven by growth in the indirect and induced employment channels, with average rises of 20.7% and 18.2% per annum, respectively.

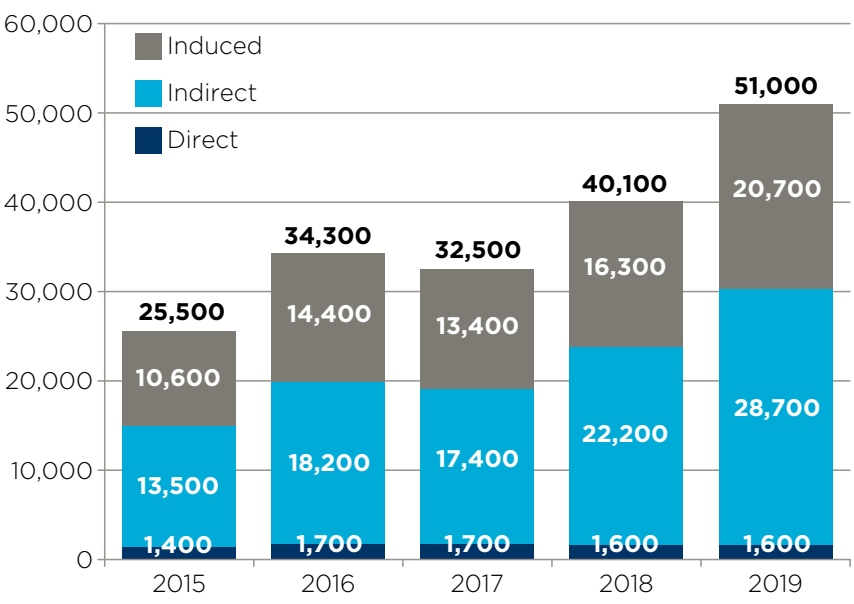
Huawei expansion of its operations in Europe has meant a large rise in the amount of taxes paid to the UK government by Huawei and firms along its UK supply chain. The amount of taxes supported has nearly tripled over the last five years, up from the £424.1 million in 2015 (in 2019 prices) to £1.1 billion in 2019 (Fig. 14); this is an average annual rise of 27.3%. In 2019 alone, the total taxes supported by Huawei would roughly be able to finance the annual salaries of 30,400 teachers in UK schools.[12]

Fig. 12: Huawei's total gross value added contribution to the UK economy, 2015-2019



Source: Huawei; Oxford Economics

Fig. 13: Huawei's total UK employment contributions, 2015-2019

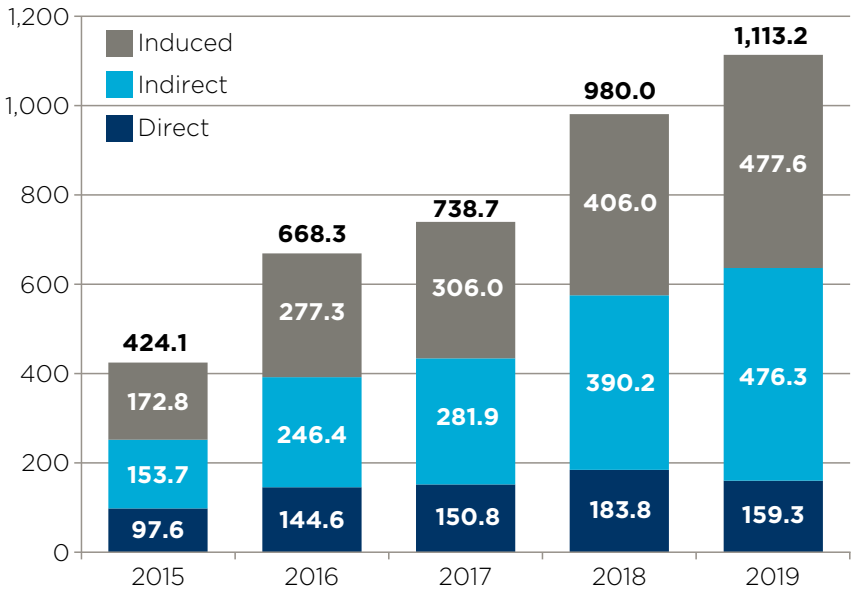


Source: Huawei; Oxford Economics

[12] Based on a gross annual salary in 2019 for a secondary education teaching professional of £36,607. ONS, 2020. *Annual Survey of Hours and Earnings*.

Fig. 14: Huawei's total UK tax contributions, 2015-2019

£ million (2019 prices)



Source: Huawei; Oxford Economics

2.5 HUAWEI'S ECONOMIC IMPACT: A REGIONAL PERSPECTIVE

Huawei has 18 offices spread around the UK. In addition, its procurement and wage payments stimulate economic activity across the nation. As a result, Huawei's impact in the UK is distributed across its various nations and regions.

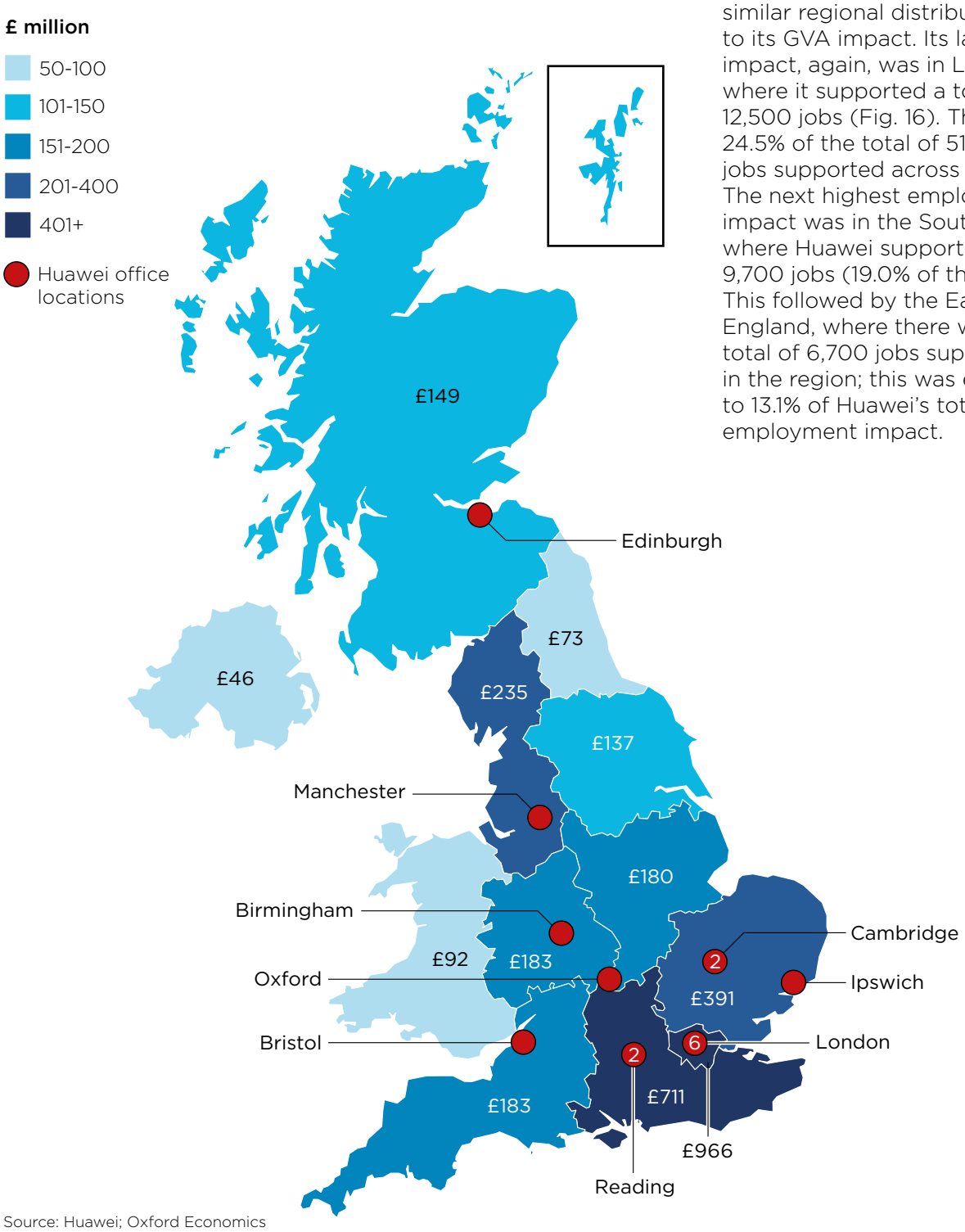
Huawei supported its largest contribution to UK GDP in London where Huawei has six offices. Its operations in London include Huawei Global Finance, which is located in the City of London and provides Huawei worldwide treasury management and platform advisory services.[13] Huawei's GVA contribution in the capital was £956.6 million, which is 28.9% of the Huawei's total for the UK (Fig. 15).

Its next biggest contribution was in the South East of England, where its head office (which fulfils many of its corporate functions in the UK) is located in Reading. We estimate that Huawei contributed £710.5 million to GVA in the South East in 2019. This represented 21.2% of the £3.3 billion GDP supported by the company in the UK.

The third largest contribution was in the East of England. Huawei has two R&D facilities in Cambridge (specialising in the Internet of Things (IoT) applications and software development for smartphone chips), with a further one under construction (see Box 5). In Ipswich, it also has a team of researchers working on the industrialisation of photonics technologies. In 2019, Huawei supported a £391.0 million GVA contribution to UK GDP in this region, or 11.7% of the total.

[13] The platform advisory services include supporting and providing technical and specialist expertise into various financial, accounting, tax, treasure and compliance activities for the Huawei group.

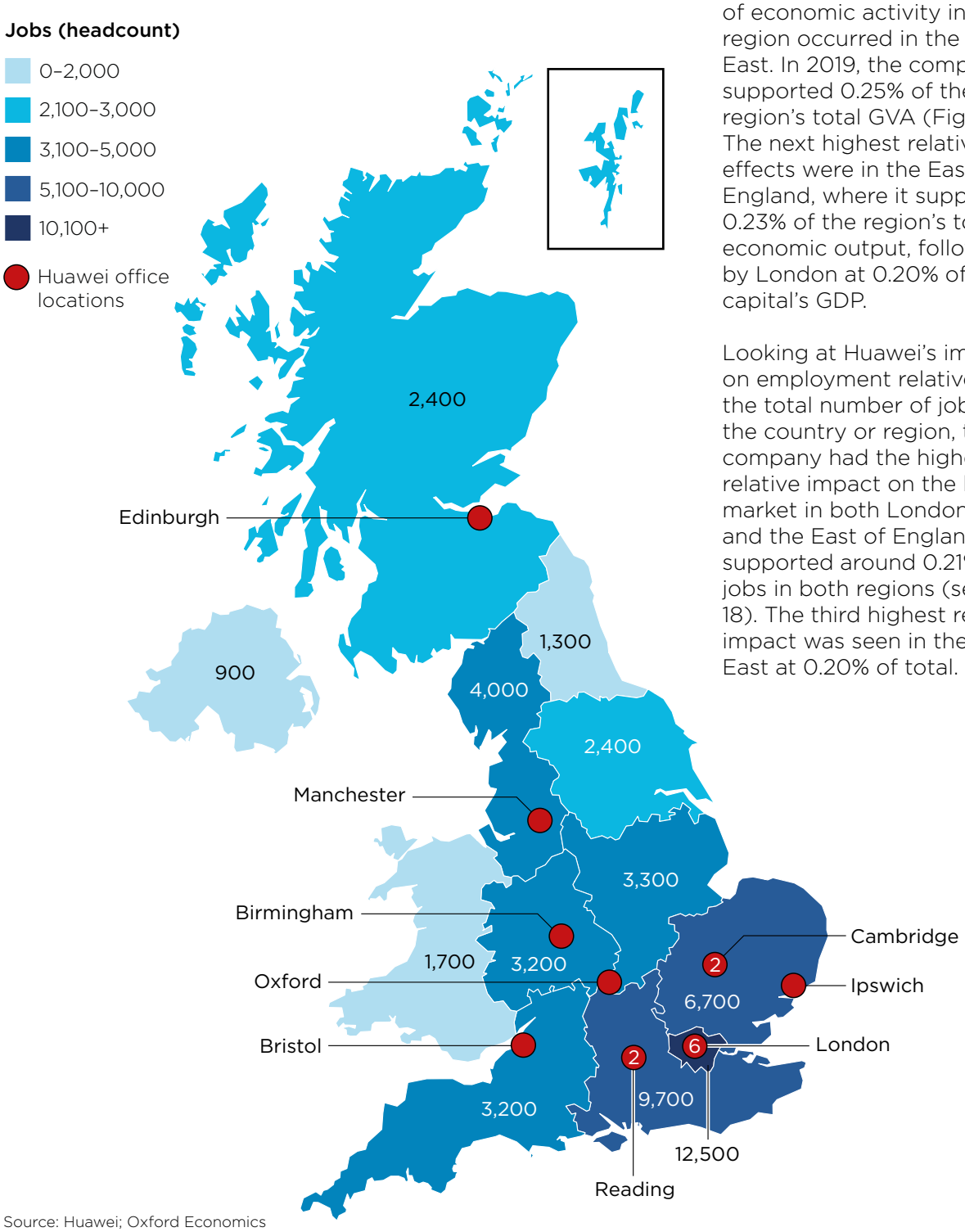
Fig. 15: Huawei's total gross value added contribution to UK GDP by region, 2019



Source: Huawei; Oxford Economics

Huawei's impact on employment followed a similar regional distribution to its GVA impact. Its largest impact, again, was in London where it supported a total of 12,500 jobs (Fig. 16). This was 24.5% of the total of 51,000 jobs supported across the UK. The next highest employment impact was in the South East, where Huawei supported 9,700 jobs (19.0% of the total). This followed by the East of England, where there was a total of 6,700 jobs supported in the region; this was equal to 13.1% of Huawei's total employment impact.

Fig. 16: Huawei's total UK employment contribution by region, 2019

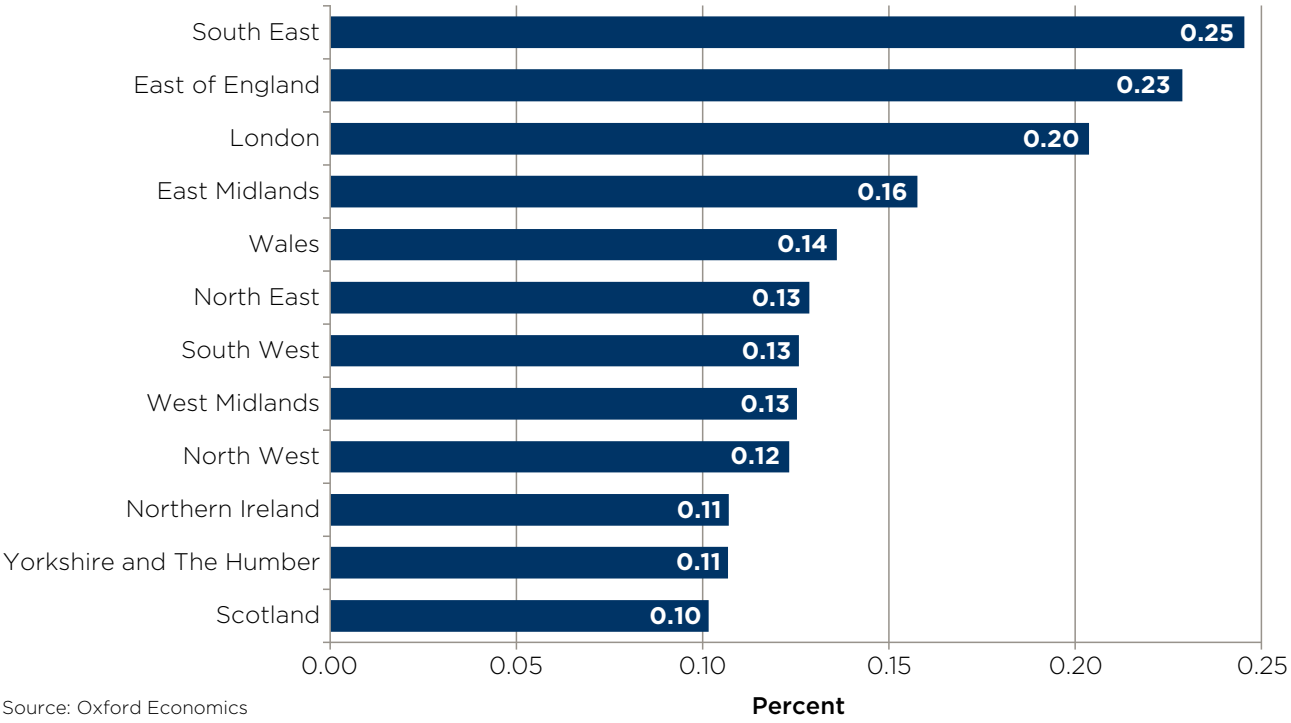


Source: Huawei; Oxford Economics

Huawei's largest impact on GDP compared to the size of economic activity in the region occurred in the South East. In 2019, the company's supported 0.25% of the region's total GVA (Fig. 17). The next highest relative effects were in the East of England, where it supported 0.23% of the region's total economic output, followed by London at 0.20% of the capital's GDP.

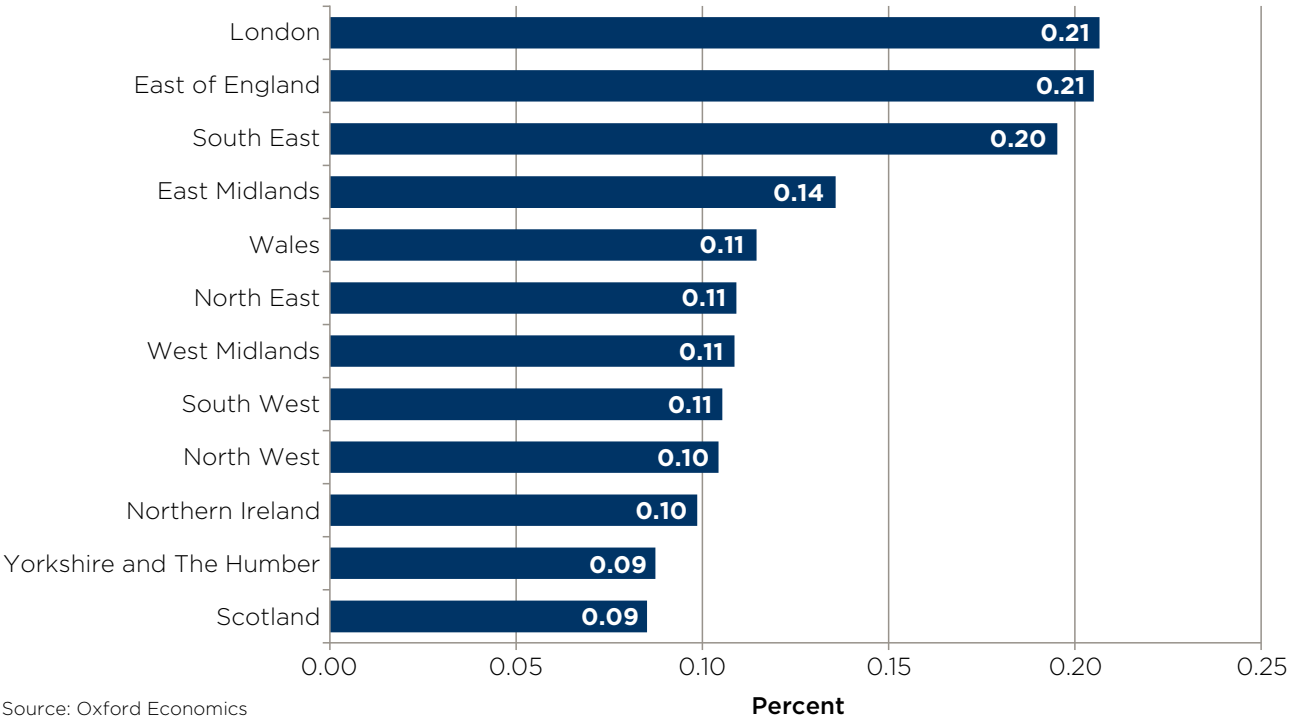
Looking at Huawei's impact on employment relative to the total number of jobs in the country or region, the company had the highest relative impact on the labour market in both London and the East of England. It supported around 0.21% of all jobs in both regions (see Fig. 18). The third highest relative impact was seen in the South East at 0.20% of total.

Fig. 17: The gross value added supported by Huawei in each region as a share of its total GDP, 2019



Source: Oxford Economics

Fig. 18: Employment supported by Huawei in each region as share of total employment, 2019



Source: Oxford Economics

BOX 3: HUAWEI'S NEW MANCHESTER OFFICE

At the end of 2018, Huawei opened a new office in the city of Manchester, located in the Blue Tower building at the flourishing MediaCityUK complex. The office houses several of Huawei's key business operations including:

- Delivery Operation Centre (DOC);
- A mobile network carrier customer support team;
- Supply chain team;
- Procurement team; and,
- Administration team.

Huawei's Delivery Operation Centre in Manchester undertakes project support and project management across its Western European operations. Its remit has expanded from originally just looking after its UK-resident operations.

The Manchester office also hosts a major mobile network carrier customer support team, aimed at providing assistance to a range of carrier customers located in the North of the UK. In the future, Huawei hopes to extend its business in the North to support the UK Fibre to the Premises broadband development. The aim of the Fibre to the Premises (FTTP) development is to increase network connectivity within the UK through the roll out of fibre optic cables which directly connect users from a local internet exchange to homes and businesses throughout the UK.

Since opening, the number of people employed at the new facility has grown from 11 to over 50. The company aims to increase its headcount in the office in the future.[14]

[14] Huawei. 2019. *Huawei Opens New Office in Greater Manchester – Major Boost to Northern Powerhouse Tech Economy.* https://www.huawei.com/uk/news/uk/2019/Huawei-Opens-New-Office-in-Greater-Manchester

BOX 4: HUAWEI'S 5G TRAINING CENTRE IN BIRMINGHAM

The UK wide rollout of 5G technologies presents new upskill challenges for engineers across the UK where 5G requires an expansion of their ICT engineering abilities. Huawei opened a new training centre in Birmingham in October 2019; aimed at providing UK engineers with the associated ICT technological training for supporting the UK's 5G rollout. Engineers from across the UK's telecoms and mobile network carriers and installation subcontractors can receive the required upskilling at Huawei's 5G Birmingham Training Centre.

Courses at the 5G Birmingham Training Centre are between three to five days duration and provide engineers training via a two-stage training programme. The first stage of the programme consists of classroom style lectures covering a wide range of ICT engineering subjects related to 5G technologies, including an introduction and principles of modern network engineering. The second stage of the programme provides engineers real 'hands-on' practical installation experience of 5G network equipment utilising onsite equipment at the training centre.[15] Once engineers have completed the programme, engineers are certified to install 5G base stations across the UK and conduct software commissioning to integrate these stations into the UK's 5G network.

Comprising of 2,800 square feet, the new 5G Birmingham Training Centre has the capacity to train 20 people at any one time and to date 260 UK engineers have graduated since the centre opened in September 2019. Due to the COVID-19 global pandemic, Huawei has moved classroom lectures and practical sessions to an online format with remote lab access, to minimize the impact on engineer and sub-contractor training; thereby, minimising the delay to the UK's 5G rollout.

In addition to Huawei's 5G technical training programme, Huawei is currently cooperating with Henley Business School to offer its online transformational leadership programme to global carrier operators. Therefore, providing innovative joint leadership training via the 5G Birmingham training centre and Henley Business School's campus to support global carrier operators with their 5G business aspirations. Huawei customers can complete Huawei's digital management programme online starting from November 2020 or when possible in future by attending the 5G Birmingham training centre.

[15] Huawei. 2019. *Huawei Opens New Training Centre in Birmingham – Investing in Engineering Talent.* October. https://www.huawei.com/uk/news/uk/2019/birmingham-training-centre-opening

3. HUAWEI'S CATALYTIC IMPACTS

Huawei boosts the productive potential of the UK economy through its expenditure on R&D, and by investing in training its own staff, and others through its ICT Academy, Learn On initiative and Seeds for the Future programme. All three activities support the UK government's Industrial Strategy to enhance the country's productive capacity, as well as supporting UK science and providing high skill jobs.

3.1 R&D INVESTMENT

Undertaking private sector R&D is a key mechanism through which firms can enhance their productivity. R&D can lead to the creation of new technologies, allow firms to transform their current production processes, and to generate more efficient ways of working.

However, the benefits of R&D investment are not limited to internal increases of productivity within the R&D providing firm. R&D spending also generates significant external spill over effects to the wider economy (for example, through labour mobility). Several academic studies highlight the positive effects of R&D investment on national productivity. Guellec and Van Pottelsberghe (2004) find that the social returns from private sector R&D are higher than the private returns.[16] At the national level, in a study of 65 countries, Bravo-Ortega and Marin (2011) found that increased per capita R&D expenditure leads to a rise in long-run productivity.[17]

Such spill over effects can occur as a result of a transfer of knowledge between firms. Academic research has highlighted knowledge spill overs are larger and occur more rapidly when R&D firms are located within a closer geographical proximity. In a study of patent citations, Jaffe et al. (1993) find that the effects of knowledge spill overs are more likely to be localised.[18]

Within the UK, increasing the level of both public and private R&D expenditure has been highlighted as one of the main goals of the UK government's Industrial Strategy in order to meet the target of 2.4% of GDP investment in R&D by 2027.[19]

The UK government's Industrial Strategy recognises that: "*For the UK to become the most innovative country in the world we need a generational increase in public and private R&D investment*."[20] As a result, increased spending by business sectors is needed to allow the UK economy to innovate and reach its full productive potential.

[16] Guellec, D. and Van Pottelsberghe de la Potterie, B., 2004. From R&D to productivity growth: Do the institutional settings and the source of funds of R&D matter?. *Oxford Bulletin of Economics* and statistics, 66(3), pp.353-378.
[17] Bravo-Ortega, C. and Marín, Á.G., 2011. R&D and productivity: A two way avenue?. *World Development*, 39(7), pp.1090-1107.
[18] Jaffe, A.B., Trajtenberg, M. and Henderson, R., 1993. Geographic localization of knowledge spillovers as evidenced by patent citations. *Quarterly journal of Economics*, 108(3), pp.577-598.
[19] HM Government. 2018. *Industrial Strategy; Building an Britain fit for the future*. Page 66.
[20] HM Government. 2018. *Industrial Strategy; Building an Britain fit for the future*. Page 66

3.2 HUAWEI'S R&D INVESTMENT

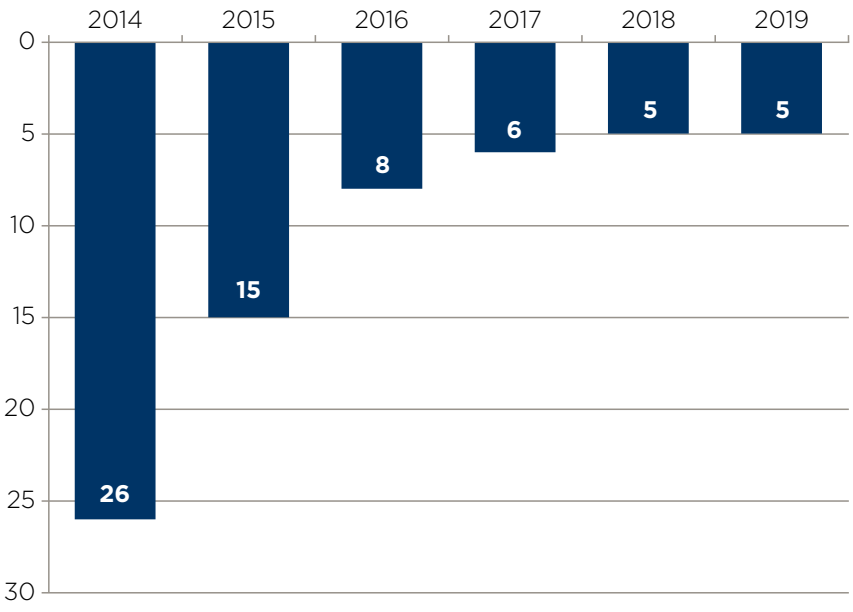
Huawei continues to grow as a major global investor in R&D. Between 2014 and 2018, Huawei rose up the European Commission's rankings for R&D in its Industrial Investment Scoreboard (Fig. 19). In 2019, it continued to be ranked fifth.[21]

Huawei undertakes a significant amount of R&D in the UK. It currently employs 510 engineering staff in its R&D functions. In 2019, Huawei undertook R&D at six sites across the UK with the aim of improving information & communications technology (ICT) infrastructure and the performance of smart devices.

A further site is being built at Sawston in Cambridge (see Box 5).

The Cambridge Research Center is largely dedicated to developing innovative communications technology to address the emerging Internet of Things market. The aim is to enable 'things' such as traffic sensors, water meters, parking bay sensors and street lights to be monitored and controlled remotely through the internet. The Cambridge facility also includes design teams specialising in high speed telecommunications, processor technologies and internet servers.

Fig. 19: Huawei's ranking in the EU Industrial Investment Scoreboard; R&D ranking of the top 2,500 companies in the world, 2014-2019



Source: European Commision

In Ipswich, Huawei's team of researchers work on the industrialisation of photonics technologies. They develop designs and early stage prototype production of optoelectronic devices that enable very high speed fibre-optic communications. In 2019, the company started to undertake a small manufacturing activity in Ipswich.

Huawei has approaching 100 R&D staff working in London undertaking fundamental research on Artificial Intelligence (AI) solutions. Their focus is on a number of topics, such as natural languages, video processing, etc. While a relatively new technology, some of this R&D is already starting to filter through into Huawei's products. For example, it is already enhancing picture clarity of the cameras in Huawei's smart devices.

The company has about 30 R&D staff in Edinburgh, with the intention of increasing this to about 70. They work on developing AI middleware technologies for future devices.

The Bristol team specialises in designs that enable video distribution over satellite systems, terrestrial wireless systems and the internet. Much of their work focuses on the development of secure technologies for these type of systems and also for IOT type security.

[21] Europe Commission. 2019. *The 2019 EU Industrial R&D Investment Scoreboard; R&D ranking of the top 2,500 companies in the world.*

BOX 5: CAMBRIDGE SAWSTON OPTOELECTRONICS R&D AND MANUFACTURING CENTRE

In 2017, Huawei began to search for a location to build a new R&D site to undertake research on Optoelectronics. It completed the acquisition of a 500 acre site in South Cambridgeshire in 2018. The company began its planning application process in early 2019, which it received in June 2020.[22]

The new centre, comprised of R&D and compound semiconductor manufacturing, will specialise in the development and manufacturing of optoelectronics products, a unique form of technology used in fibre optic communications to generate fast broadband connectivity. The investment will drive the development of fibre optic communication systems which can be created and distributed on a global scale.

The first phase of development will involve a £1 billion investment to construct 50,000 square meters of facilities and is estimated to create 400 jobs within the local area[23]. Once completed, the Cambridge Huawei campus will become the centre of Huawei's international optoelectronics business.

[22] The Cambridge Independent. 2020. *Huawei's new £1bn R&D site 'will be a major asset to the UK' says CEO'.*
[23] Huawei. 2020. *Huawei to Build an Optoelectronics RnD and Manufacturing Centre in Cambridge.* https://www.huawei.com/uk/news/uk/2020/huawei%20to%20build%20an%20optoelectronics%20rnd%20and%20manufacturing%20centre%20in%20cambridge.

3.2.1 Collaboration with universities

In 2019, Huawei has furthered its collaborations with over 30 universities and research institutions throughout the UK. Its partnerships with universities in the year largely took one of three forms.

Huawei supported multiple conferences and research events run by universities and research institutions. It also increasingly ran its own collaborative workshops between academics and staff. In the year, Huawei ran over 30 workshops across Europe including several in the UK. Due to the coronavirus pandemic, Huawei moved many of its traditional in-person workshops to online events in 2020. The workshops include discussions hosted by academics and technical experts from across Huawei to explore topics at the forefront of technological research, such as Artificial Intelligence. One example of this is the Huawei – University of Cambridge technology workshop held in 2020. The workshop covered a range of technology topics including Machine Learning, and saw over 400 industry experts, researchers, and academics join in an attempt to bridge the gap between industry and research institutions.

Huawei has also contributed to the development of several joint labs throughout the UK, focussing on generating more effective collaborations between universities and industry. Joint labs are formed between industry and the universities and allow academic researchers to work with industry experts to create cutting edge research which helps foster innovation. One example of this is the opening of a joint lab as part of the three-year partnership between Huawei and the University of Edinburgh in 2017, aimed at exploring data management technology.[24]

In addition, Huawei also sought to improve the calibre of the research departments of the UK universities the company works with in 2019. It provided research resources to them to help strengthen the academic expertise at their disposal, helping to boost their research capacity.

3.3 INVESTMENT IN UK SKILLS

Huawei also boosts the productive potential of the economy through its investment in staff training. By upskilling its staff, it increases their competence and efficiency, thereby raising their productivity.

Investment in training may bring Huawei other benefits.[25] It is argued a more highly skilled workforce is an asset that makes it easier for companies to innovate. The skills learned on a training course may help firms develop new products and services, or adapt more rapidly to the introduction of new technology or changes in work processes.

In 2019, Huawei spent £1.1 million on training its UK-resident staff. Huawei's staff training can be divided into two types; that provided internally by the company itself and external training provided by outside providers. The majority of staff training is internally provided.

At the centre of Huawei's internally provided training is Huawei University. It runs a myriad of courses, mostly focusing on ICT technical training and management training. The courses are delivered in person in a classroom setting, typically involving the UK staff member travelling to China, Germany or one of the companies' other offices to participate in a course of an average duration of three to five days. As well as the course content, staff also benefit from interacting with other employees from around the globe.

Huawei's staff are also required to undertake online courses as part of their development and career progression. Some of these are general courses, such as project management, and compliance training like competition law, Anti-Bribery, etc. and all courses are typically tailored to their role and experience level.

[24] The University of Edinburgh. 2017. *Huawei and the University of Edinburgh to open joint lab. https://www.ed.ac.uk/informatics/news-events/stories/2017/huawei-university-of-edinburgh-joint-lab-opening*

[25] European Centre for the Development of Vocational Training. 2011. *The impact of vocational education and training on company performance.* CEDEFOP Research Paper No. 19.

The externally provided courses Huawei's staff are required to take are common to many UK firms. So for example, they would include the ACCA and CIMA accountancy qualification courses, the CIPD for human resources staff and the GDPR compliance courses.

Huawei's training of its own staff is aimed at increasing their competence and efficiency. But there may also be knowledge spillovers from Huawei's training its own staff to other firms in the local economy. These can occur through knowledge sharing through trade bodies, external courses, or informal interactions with other firms' staff. Alternatively, it may happen when people leave the company to take jobs elsewhere.

Huawei also makes substantial efforts to upskill other UK-resident in ICT skills through its ICT Academy, Learn On programme, and Seeds for the Future programmes.

Huawei's ICT Academy programme offers ICT courses, teaching aids, and support services to academic institutions and their students. In 2019, about 20 schools, colleges, and universities in the UK participated in the programme. The courses cover a broad range of cutting edge ICT content, including, for example, cloud computing, big data, artificial intelligence, the Internet of Things (IoT), etc. It is aimed at providing students from Level 3 (A level equivalent) up to Phd level with the latest practical skills to work in the ICT industry. Students can take examinations at different levels of complexity to achieve a globally recognized ICT industry certification.

The coronavirus pandemic prompted Huawei to go further in 2020, with the launch of its Learn On programme. Through this initiative, anyone in the UK can sign up for one or more of the courses offered by the ICT Academy programme. Participants study online, get access to webinars to prepare them for the examinations process, and can then take a Huawei certified exam to secure a digital qualification. The whole process is available for free.

Huawei also contributes to the stock of skills in the UK economy through its Seeds for the Future programme. Since 2011 over 250 STEM undergraduate students from UK universities have participated in the programme. The objective of Seeds for the Future is to provide talented undergraduates with technological training and encourage a greater understanding of ICT.

In 2019, 50 STEM undergraduates from the leading 25 UK STEM universities participated in a month-long trip to China. The students came from universities located in three of the four UK nations, and all nine of the English regions. During the programme the students visited Beijing, where they were given lessons in Mandarin by the Beijing Language and Culture University and experienced Chinese culture first-hand visiting landmarks in and around the capital. Students then visited Huawei's headquarters in Shenzhen to learn about Huawei's international business by partaking in lectures and laboratory work. Following the programme, Huawei organised a 'STEM Skills to STEM Careers' event which allowed Seeds Alumni to network with recent graduate employees to learn about technology careers at Huawei.

In 2020, the Seeds for the Future programme was virtualised due to the coronavirus pandemic. Some 70 STEM undergraduate students from UK universities participated in a one-week digital training programme. The online programme, organised in partnership with the British Council, included lectures delivered by academics as well as cultural sessions. Students participated in online courses that included: introductions to Huawei; ICT courses covering 5G, cloud computing and artificial intelligence; and virtual tours of Huawei's laboratories and campus. Students also selected from additional technical courses ranging from the internet of things (IoT), the digital economy, as well as leadership and personal effectiveness courses. Useful lessons from virtualising the Seeds training in 2020 will be carried forwards and enhanced for future programmes.

4. CONCLUSION

In conclusion, Huawei has had—and continues to have—a sizeable positive impact on the economy, employment, and the skills and research base of the UK. By quantifying the impact of Huawei's spending across Europe on the UK over the five years to 2019, we have for the first time been able to capture how investment in neighbouring economies triggers activity in its supply chain in the UK.

The last five years up to 2019 alone have seen an almost threefold increase in Huawei's contribution to the UK economy—a 180% increase to £3.3 billion in 2019 from £1.2 billion in 2015 and far surpassing the 6% growth in the UK economy as a whole. While the company's direct impact was £328 million, its procurement programme stimulated £1.7 billion of activity, and spending by its employees and those of its suppliers added another £1.4 billion via consumer spending.

There is a similar story in terms of jobs and tax receipts. While Huawei employed 1,600 people directly in 2019, its activities supported some 28,700 jobs in its supply chain and a further 20,700 in the wider economy thanks to the wages paid. Huawei has a made a major contribution in terms of tax receipts to the UK Treasury with an estimated total tax contribution of £1.1 billion from its activities, more than double the £424 million in 2015.

Huawei has also supported a wider 'catalytic' contribution to the UK economy. By investing in R&D itself and partnering with universities across the UK the company has fostered innovation in ICT infrastructure and the performance of smart devices. By spending on staff training, providing training for its partners' employees at its 5G Training Centre in Birmingham, and helping to build ICT skills through its ICT Academy, Learn On and Seeds for the Future programmes, Huawei has helped build the UK's digital skill set. Both initiatives should provide a major boost to the UK's productive potential.

In all these ways, Huawei has made a substantial contribution to the UK economy over the last five years by stimulating economy growth, supporting tens of thousands of jobs, delivering extra revenue to the Treasury, and adding to the country's skills base and R&D capability.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APPENDIX 1

METHODOLOGY FOR CAPTURING HUAWEI'S DIRECT IMPACTS IN THE UK

The direct impact of Huawei in the UK—including gross value added, jobs created, and taxes paid by the UK-resident businesses and employees—was estimated from information provided by the company.[26]

METHODOLOGY FOR CAPTURING THE INDIRECT IMPACTS

We have taken a different approach to modelling the impact Huawei has on its UK-resident supply chain than in the 2015 and 2019 versions of this report. The reason for this is to be more comprehensive and be consistent with the approach we took in the Europe-wide study.[27]

Fig. 20: The procurement impacts we are considering in this report versus the 2015 and 2019 studies

In the two earlier reports on Huawei's impact on the UK economy, we only had data on the procurement from UK suppliers from Huawei's UK-resident subsidiaries and from its global headquarters in Shenzhen. This we combined with an UK input-output table published by the Office for National Statistics and some of its other data to estimate the impact of this spending on Huawei's UK supply chain. Using the UK national input-output table means that any procurement along the supply chain from outside of the UK is lost, regardless of whether expenditure is undertaken with UK suppliers further down the chain.

In this report, we have additional data on Huawei's procurement. This makes our modelling of its impact on its UK-resident supply chain more comprehensive and therefore larger. The additional data reflects two extra sources of spending which will stimulate economic activity in the UK (see Fig. 20). First, we have data on the spending on inputs of goods and services by Huawei's major subsidiaries in 11 countries around Europe, some of which will be spent directly with UK suppliers.[28] Second, we have data on the company's global headquarters' procurement from suppliers in the other 11 European countries. Some of the companies Huawei purchases inputs from around

[26] The employee compensation data used in this year's report includes that paid to contract workers. These data were excluded from the previous year's report. The direct tax payment data used in this report includes VAT and some employment taxes, which were excluded from last-year's report.
[27] Oxford Economics. 2020. *The Economic Impact of Huawei in Europe*.
[28] The 11 markets were: Denmark, Finland, France, Germany, Hungary, Italy, the Netherlands, Poland, Spain, Sweden, and Switzerland.

Europe are likely to draw on intermediary inputs of goods and services made by UK suppliers. This spend by Huawei's suppliers around Europe will also stimulate economic activity in the UK.

To estimate the cross-border nature of these supply chain's impact on firms located in the UK, Oxford Economics has utilised an input-output model of the European economy, using the latest OECD Inter-Country Input-Output Table as its starting point.[29] This will capture the impact on UK suppliers from Huawei's procurement across its key 11 European markets, as those supply chains criss-cross the UK's borders.

Our estimates of the supply chain impacts on the UK are therefore more comprehensive. They capture both the direct spend on UK suppliers from Huawei's key subsidiaries around Europe and the knock on impacts of Huawei's European suppliers fulfilling their orders using intermediary goods and services sourced from UK suppliers.

This procurement spending data was split into a pattern of purchases, by type of product and location of supplier, taking into account information in the multi-country input-output table for the "hi-tech goods manufacturing" sector, of which Huawei is a part. Each year's data was fed into the model to arrive at total sales along the UK supply chain, by sector of supplier, for the year concerned. The indirect contribution to GDP was worked out from there, using GDP-to-sales ratios for each industry, taken from the OECD I-O table. The indirect employment impact was calculated in turn from there, using GDP-to-jobs ratios for each industry for that year.[30]

Finally, tax contributions were estimated taking into account sales, GDP and employment by industrial sector, and applying various appropriate tax-to-expenditure and tax-to-income ratios, sourced from the OECD, Eurostat and the HMRC.

METHODOLOGY FOR CAPTURING THE INDUCED IMPACTS

The induced impacts have also been calculated using a different methodology than the previous UK only studies and are not comparable. The estimates are more comprehensive and therefore larger as they include the additional expenditure and use the European input-output modelling methodology described in the indirect section above. So UK businesses benefit from additional wages being paid by Huawei to its staff in its key European offices in 11 countries and in its wider European supply chain. This spending will impact the UK economy through tourism, the purchase of UK-made consumer goods and services, and the purchases of UK-made intermediary goods and services that feed into the consumers goods and services those people buy.

The induced sales figures for each year were worked out in two stages. The impact relating to spending by employees in Huawei's European supply chain was worked out alongside the indirect impact, taking Huawei's procurement as the starting point. This calculation used an extended part of the input-output model, which takes into account the pattern of European household consumption as well as intra-industry transactions. The impact relating to spending by Huawei's own employees was modelled separately, using estimates of their spending power—the company wage bill net of employees' tax and social security contributions—as the starting point. The two estimates of induced sales, on an industry-by-industry basis, were added together and the induced GDP, jobs and tax impacts that occurred in the UK estimated from there.

[29] OECD. 2018. *OECD Inter-Country Input-Output (ICIO) Tables.*
[30] Based on GDP and employment data also sourced from the OECD.

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The modelling and results presented here are based on information provided by third parties, upon which Oxford Economics has relied in producing its report and forecasts in good faith. Any subsequent revision or update of those data will affect the assessments and projections shown.

To discuss the report further, please contact:

Oxford Economics
Broadwall House,
21 Broadwall,
London,
SE1 9PL, UK

Tel: +44 203 910 8000

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HUAWEI

OXFORD
ECONOMICS

Global headquarters
Oxford Economics Ltd
Abbey House
121 St Aldates
Oxford, OX1 1HB
UK
Tel: +44 (0)1865 268900

London
4 Millbank
London, SW1P 3JA
UK
Tel: +44 (0)203 910 8000

Frankfurt
Marienstr. 15
60329 Frankfurt am Main
Germany
Tel: +49 69 96 758 658

New York
5 Hanover Square, 8th Floor
New York, NY 10004
USA
Tel: +1 (646) 786 1879

Singapore
6 Battery Road
#38-05
Singapore 049909
Tel: +65 6850 0110

Europe, Middle East and Africa

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Mexico City

Asia Pacific

Singapore
Hong Kong
Tokyo
Sydney
Melbourne

Email:
mailbox@oxfordeconomics.com

Website:
www.oxfordeconomics.com

Further contact details:
www.oxfordeconomics.com/about-us/worldwide-offices