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An Update on IP-Related and Commercialisation Activities in England in 2020/21.

Report detailing IP-related and commercialisation activities submitted as part of the HE-BCI survey, focussing on those conducted in England in 2020/21.

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HE-BCI Survey 2020/21

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Introduction

- The Higher Education Business and Community Interaction (HE-BCI) survey is an essential source of information on university knowledge exchange (KE) in the UK. 'Business' in this context may refer to private, public, and third-sector partners of all sizes¹. 'Community' in this context means society as a whole outside higher education providers (HEPs), including all social, community and cultural organisations, individuals, and the public, both nationally and internationally.
- 2. The survey records information on a wide range of interactions with external partners and the wider world, such as collaborative and contract research, consultancy, continuing professional development, regeneration and development programmes, the exploitation of intellectual property and other activities with a direct social benefit, such as hosting events in museums and giving public lectures.
- 3. The data is collected by the Higher Education Statistics Agency (HESA). All publicly funded HEPs in Wales, Scotland and Northern Ireland; and HEPs registered as Approved (fee cap)² in England are required to submit data to the HE-BCI survey. HEPs who do not receive public funding may also submit data to HE-BCI but they have been excluded from the data presented in this report.³ HEPs provided data for activity occurring during the academic year 2020/21.
- 4. Furthermore, this report comments on a subset of the total providers that completed the HE-BCI survey for 2020/21, in order to maintain comparability with the data collected in previous years and analyse year-on-year trends relating to IP income. Therefore, new HEPs recently added to the Office for Students (OfS) register are not included in these aspects of the analysis, however as these providers conduct relatively little commercialisation activity conclusions drawn in this report remain broadly representative of the sector.
- 5. The HE-BCI survey collects income to HEPs, which is considered a sound proxy for the impact of their KE activities⁴. The main indicators for which income to HEPs reflects the market value of these resources in the economy and society are collaborative research, contract research, consultancy, equipment and facilities, continuing professional development (CPD), regeneration, and Intellectual Property

¹ The 'third sector' refers to voluntary and community groups, social enterprises, charities, co-operatives and mutuals.

² FE and sixth form colleges are excepted from the requirement to submit to HE-BCI

³ Data from the University of Buckingham is excluded from this report as it is not a publicly funded HEP.

⁴ See <u>Allocating HEIF: The suitability of knowledge exchange income as a proxy for outcome performance</u>.

(IP) income. In addition, external investment into spin-outs can also be deemed a reasonable proxy for impact⁵.

- 6. This report provides an update on similar analysis published in the 2021 report⁶ by Research England commenting on the 2019/20 HE-BCI data release.
- 7. This report covers the academic year August 2020 to July 2021 and includes substantial periods of national restrictions due to the Covid-19 pandemic. Therefore, all findings and trends should be considered in light of possible effects that the Covid-19 pandemic and related disruptions may have had on the HE sector, and the varying impact on different sectors and disciplines⁷.

The UK's Knowledge Exchange Landscape

- 8. The following section of the report outlines the overall sources of KE income in the UK and England in 2020/21 as collected in the HE-BCI survey, with data for the UK illustrated in Figure 1 below. In 2020/21 the total income to UK HEPs increased by £77 million (1.52%) to £5.16 billion compared to that of 2019/20. This reflects a continued decrease in growth as observed in 2019/20, where total UK KE income increased by 3.1%. This followed increased annual growth since 2016/17. The decreases in growth since 2019/20 may reflect the wide-ranging impact of the Covid-19 pandemic on KE income within the UK Higher Education sector.
- 9. Given that the 2020/21 academic year was the first full academic year impacted by the Covid-19 pandemic, the continued growth in KE income however demonstrates the UK Higher Education sector's resilience and innovation in a period of significant disruption and instability. There remains a broader trend of growth in KE income across the past 5 years, with total KE income in the UK increasing by 22% since 2016/17, compared to a 20% increase for total UK GDP in the same period.⁸

⁶ See https://www.ukri.org/publications/higher-education-business-and-community-interaction-analysis-reports/

⁵ See 'Assessing the Gross Additional Impacts of the Higher Education Education Innovation Fund (HEIF)'

⁷ See <u>Innovating During a Crisis: The Effects of the Covid-19 Pandemic on How Universities Contribute to Innovation</u> (2021)' and 'Through Crisis to Recovery: the ongoing effects of the COVID-19 pandemic on universities and their ability to <u>drive innovation</u>' (2022)

⁸ See, 'From resilience to recovery the contribution of higher education knowledge exchange (2022) <u>From resilience to</u> recovery: the contribution of higher education knowledge exchange - National Centre for Universities & Business (ncub.co.uk)



Figure 1: Total income for each category across all UK providers stacked for each academic year from 2014/15 to 2020/21.

- 10. Collaborative research income continued to grow in 2020/21 with an increase of 2.02%. This marks a slower increase than in recent years which saw increases of 10% (2017/18), 11.7% (2018/18) and 8.74% (2019/20). As the proportionally largest KE income stream for the UK sector, this slower rate of increase is likely a key influence in the slow in total KE income growth in 2020/21.
- 11. In addition, there was a 1.37% year-on-year increase in regeneration and development income in 2020/21. This marks a significantly slower increase than in recent years, where income has been reducing since a high of 26% in 2017/18.
- 12. As shown in Figure 2, significant increases in 2020/21 compared to 2019/20 can also be observed in income from consultancy contracts (8.85%) and facilities & equipment

(21.3%). Both of these categories saw decreases in income in 2019/20, potentially reflecting the immediate challenges at the start of the Covid-19 pandemic and makes their significant increases in 2020/21 more notable. Income from both categories in 2020/21 exceeded that seen in 2018/19, suggesting the resilience of universities in conducting such activities in challenging economic environments.



Figure 2: UK Income from consultancy contracts and facilities and equipment related services from 2014/15 to 2020/21

13. However, decreases in income were reported for contract research (1.03%), CPD and Continued Education (CE) courses (4.19%), and IP income (including the sale of shares in spin outs) (3.46%). The small decline in contract research and CPD and CE income are potentially not unexpected, due to the ongoing impact of the Covid-19

pandemic and the related limitations on businesses, particularly SMEs which saw pressure on cash flows along with increased liquidity needs.⁹

14. It is important to note that IP income is contingent on the activities of a relatively small number of providers generating high incomes. Consequently, income in this area can fluctuate significantly, with year on year increases of 40%, 30% and 9% seen in 2017/18, 2018/19 and 2019/20 respectively. Therefore, the relatively small decrease of 3.45% in the income generated from IP is most notable given the consistent fluctuating increases in IP income in recent years. There are a range of potential reasons for a decline in IP income during 2020/21, from potentially less profitable commercial activity during the pandemic to varying or shifting in terms from providers. Income levels in England have remained more stable than within the devolved nations, and there are significant fluctuations in IP income in Northern Ireland and Scotland, which will be discussed in more detail later in this report.

For the remaining sections of this report all data is based on English providers only unless otherwise stated.

- 15. The total KE income for English providers in 2020/21 was £4.09 billion. This reflects a 1.8%, £74 million, decrease compared to 2019/20. Although notably 2020/21 activity remains £25.7 million (0.6%) greater than in 2018/19, the most recent academic year unaffected by the Covid-19 pandemic.
- 16. The small overall decrease in KE income in England can be seen in Figure 3. Despite this being the first year-on-year decrease in total income in England since 2014/15, it is relatively small and therefore demonstrates the resilience within the sector overall, given the challenging environment in 2020/21. Overall, this decline can be attributed to the relatively small declines in income from collaborative and contract research, which also observed small declines of 0.7% and 0.8% respectively. Collaborative and contract research combined contributes just under two thirds of the total KE income and therefore often influence overall sector trends. As shown in Figure 5, intellectual property income also saw a decline of 11.3% in 2020/21, in comparison to a 1.6% increase in 2019/20.
- 17. It is useful to utilise KE clusters as a means of analysing the way KE income has changed across the sector, in particularly between 2020/21 and 2018/19, as the most recent year without likely impact by the Covid-19 pandemic. As has been observed in

⁹ THE BANK OF ENGLAND Staff Working Paper No. 924 Impacts of the Covid-19 crisis: evidence from 2 million UK SMEs James Hurley, Sudipto Karmakar, Elena Markoska, Eryk Walczak and Danny Walker June 2021

other literature, data suggests that the impact of the pandemic may have been felt in different ways across the sector, and recovery may also have bee¹⁰ Four KE clusters (STEM, E, J and V) have reported higher levels of KE income compared to 2018/19. The STEM cluster has experienced a 20% increase in KE income between 2018/19 and 2020/21, and clusters V, J and E have seen increases of between 1-3%. Clusters M, X and Arts have all reported lower levels of KE income compared to 2018/19. The Arts cluster has seen its total decrease of 26% compared with 2018/19. Clusters M and X have seen smaller declines of 15% and 9% respectively over the same period. This may reflect a wide array of factors, including the types of KE these clusters these clusters may focus on, the types of organisations providers in these clusters generally undertook KE activities with, and their geographical location. It will be important to continue to observe carefully the trends in KE income and recovery by cluster in the future.

18. Changes in KE income in England compared to total changes in the UK were more dissimilar than in previous years. Decreases in income were observed in all KE income categories in England in 2020/21 other than in consultancy contracts income which saw a 9.5% increase as shown in Figure 5. Regeneration income, which saw a small overall increase in the UK as a whole, saw a significant decline of 12.3% in England in 2020/21. Similarly, Facilities and Equipment income, which saw a significant increase of 21.3% at UK level, saw a decline of 1.5% in England.

¹⁰ <u>' Through Crisis to Recovery: the ongoing effects of the COVID-19 pandemic on universities and their ability to drive</u> <u>innovation</u> (2022)





- 19. Of particular interest in the 2020/21 data is the relative activity of universities with different partner organisation types. KE income from SMEs and non-SME commercial businesses for contract research, facilities and equipment, intellectual property and CPD (the HE-BCI income categories with partner type disaggregation is provided) all declined in 2020/21. However, income from non-commercial partners increased across all income streams, ranging from 2.9% for IP income to 5.3% in facilities and equipment income.
- 20. However, the year-on-year growth of income from consultancy contracts is notably significant, particularly in comparison to the 5.5% decline witnessed in 2019/20. The

overall consultancy contract income is mirrored by increases across all types of partner engagement, 13.7% income increase from SMEs, 7.2% increase from other (non-SME) commercial businesses and 9.5% increase from non-commercial businesses as shown in Figure 4. This contrasts with other HE-BCI income categories which have seen declines in income from SME and other (non-SME) commercial businesses across the board when disaggregated data is provided.

Figure 4: Total Consultancy Income by Organisation type with English Providers from 2014/15 to 2020/21



21. The continued increase in income from consultancy contracts with non-commercial businesses reflects the largest year-on-year increase in this income stream since 2016/17. Additionally smaller increases in income from activities with SMEs and other (non-SME) commercial businesses may be reflective of activity returning to more usual volume, following smaller declines in previous years. Overall, these growths in activity may reflect adaptability of HEPs to engage with partners of all types and their ability to potentially meet an increased demand for consultative activity following a period of decline in 2019/21 due to potential initial effects of the Covid-19 pandemic.

Figure 5: Year-on-year percentage change in income for each category in 2019/20 and 2020/21.



Income Category

Intellectual Property Income, Patents and Spin-Outs

22. One area of knowledge exchange receiving considerable interest is commercialisation and the exploitation of research for the benefit of society and the economy. Therefore, the remainder of this report focusses on this area of current policy interest, examining income from intellectual property, patents, and spin-outs.

IP income

- 23. The HE-BCI survey collects data on the total IP income received by providers which can be divided into income due to sales of shares in spin-outs and the subtotal IP income. In addition, the subtotal income can be further categorised by the source of income (software licences, non-software licences, and other IP) and the type of organisation.
- 24. Although income to English providers from IP was still significant in 2020/21 at £226m, this marks a year-on-year decrease of 11.3% following a 3-year period of growth as illustrated in Figure 6. This decrease follows a slow in growth to 1.6% in 2019/20 after notably greater increases in IP income of 45% in 2018/19 and 46% in 2017/18.
- 25. The decrease in 2020/21 can be attributed to declines in both subtotal IP income and sales of shares in spin-outs of £14m (7.1%) and £14.6m (26.8%) respectively. However, these decreases continue to reflect potential challenging environments caused by the Covid-19 pandemic, following an initial slowing of growth in subtotal income in 2019/20 and the decline in sale of spin-out shares of 16.9% in 2019/20.
- 26. The proportion of IP income coming from subtotal IP income increased from 79% in 2019/20 to 82% in 2020/21, marking a continued increase as observed in previous years.
- 27. It is important to note that sales of shares are highly variable in nature and due to activity being relatively concentrated in a small proportion of the sector, overall sector trends can be highly dependent on fluctuating activity of individual providers. The 2020/21 sector decrease can be attributed primarily to significant decreases in sales by Imperial College of Science, Technology and Medicine, which saw a total income of £2.4 million from the sales of shares in spin-outs in 2020/21, compared to £25.4 million in 2019/20. A smaller, but still significant decrease was seen in the sale of shares in spin-outs by the University of Surrey (£27,000 in 2020/21 from £4.3 million in

2019/20). It is important to consider significant changes for individual providers may also be driven by strategic changes in institutional policy.

28. However, other providers saw increases in income from the sale of shares in spin-outs that were of note, though these were balanced by the provider decreases described above. For instance, University College London increased their income by 85.3% to £25.2 million in 2020/21 from £13.6 million in 2019/20, and the University of Cambridge observed a 134% increase from £0.98 million in 2019/20 to £2.1million in 2020/21.

Figure 6: Combined total of the sale of shares in spin-outs and the subtotal IP income for each academic year from 2014/15 to 2020/21.



29. It is also important to note that trends observed in the total IP revenues, similar to sales of shares in spin-outs, are highly dependent on changes in a small number of providers. As illustrated by Figure 7, in 2020/21 IP income from just six providers represented 78% of the total income figure. This is consistent with 2019/20 when the top 6 providers represented 80% of the total income figure.

30. It is also important to emphasise that Figure 7 includes the sale of shares, which are naturally highly variable, and also that the six providers highlighted are those specifically with the greatest IP income in 2020/21 so this analysis should be considered as a snapshot rather than indicative of a long-term trend.

Figure 7: Total IP income (including sale of shares in spin-outs) across English HEPs for each academic year from 2014/15 to 2020/21, highlighting the proportion contributed by the six providers with the greatest total IP incomes in 2020/21.



31. Subtotal IP income can be disaggregated by the type of organisation the activity is with, and this is illustrated in Figure 8. The overall decrease in subtotal IP income in 2020/21 can be attributed to the decrease in income from activity specifically with large businesses as this accounts for majority of sub-total IP income, and demonstrated a 10.5% decrease between 2019/20 and 2020/21. Also notable is the 2% decrease in subtotal IP income from activity with SMEs between 2019/20 and

2020/21. This follows a period of growth for income with all organisation types in 2019/20 (although noting growth in income from large business activity had slowed considerably in 2019/20), which may suggest effects on IP-related income with commercial businesses were felt more significantly in 2020/21 after the initial onset of the Covid-19 pandemic.

32. There was continued growth in IP income with non-commercial organisations in 2020/21 of 3%. This demonstrates the resilience of the sector's engagement with non-commercial partners when other activity may have been affected by the Covid-19 pandemic.





33. Subtotal IP income can also be disaggregated across all organisation types by the source of IP income, and is displayed in Figure 9. The relative distribution of income between different sources remained similar to that in 2019/20 and 2018/19, with non-software licencing remaining the predominant source of income with 84% of the total, and software and other IP income contributing 5.6% and 10% respectively. The

proportion of income derived from the sale of software licences has increased slightly from 2019/20, when it accounted for only 4.3% of overall subtotal IP income.

34. Of note is the 8.1% decrease in non-software licensing income in 2020/21, which is also significant as it follows a period of growth since 2016/17, although growth had slowed to 4.6% increase in 2019/20. It is not unexpected that the trends in non-software licencing income and that from large businesses mirror the overall trends in subtotal IP income as income from non-software licences with large businesses contributed 55.4% of the total income in 2020/21.



Figure 9: Total IP income across all organisation types for different sources of income for each academic year from 2014/15 to 2020/21

35. As shown in Figure 10, 2020/21 saw a significant increase in the average value of non-software licencing deals, which increased by 38% to £83,500 from £60,400 in 2019/20. However, this has been coupled with a decline in the number of non-software licenses generating income which occurred for the first time in 2020/21 as well as a continued decline in the proportion of all non-software licences that generate income, to 13% from 20% in 2019/20. Although this is a longer-term decline exhibited since

2017/18, coupled with the 34% decrease in the number of non-software licences in 2020/21, this is the first time this non-software licence income has decreased since 2016/17.

36. The continued increase in the proportion of all non-software licences that do not generate income longer term from 38% in 2016/17 to 87% in 2020/21, perhaps reflects a shift to more open models of innovation, or recognition of the need to the balance income generation with impact generation. For instance, the rise in use of the so-called NERF (non-exclusive royalty-free) licences in response to the Covid-19 pandemic could be an example of such a shift¹¹, and be one contributing factor to the decrease in reported licences generating income.

Figure 10: Average size of income generating non-software licences and the proportion of all non-software licences not generating income for each academic year from 2014/15 to 2020/21



¹¹ See, for example, <u>https://innovation.ox.ac.uk/technologies-available/technology-licensing/expedited-access-covid-19-</u> related-ip/

37. Furthermore, Figures 11 and 12 below compare the sources of IP income for each organisation type. Between 2019/20 and 2020/21 the proportion of IP income relating to non-software sales decreased slightly and that relating to software sales increased, across all each organisation types. The proportion of IP income with non-commercial partners relating to other IP increased, while for SMEs and large businesses it declined.





Figure 12: Proportion of IP income from different sources for each organisation type in 2020/21.



Disclosures and patents

- 38. The HE-BCI survey records a range of data relating to IP, including numbers of disclosures, patents filed, patents granted, cumulative patent portfolio (and patents filed by an external party). However, caution should be taken when discussing trends in disclosures as there may not be a consistent definition between providers as to what qualifies as a disclosure.
- 39. In 2020/21 the number of disclosures continued to decrease, at a rate of 12.4%, which is more similar to that observed in 2018/19, than the smaller rate of decline of 5.2% in 2019/20. When considered alongside the continued increase in patenting activity (discussed below), this decrease may be a result of greater selectivity around the

definition of a disclosure rather than a decrease in discoveries or patentable ideas from providers.



Figure 13: Total number of disclosures for each academic year from 2014/15 to 2020/21.

40. As shown in Figure 14, patenting activity continued to grow in 2020/21, albeit at a slower rate than in previous years. The total number of patents granted across the sector increased by 4.3%, though the total sector cumulative patent portfolio remained stable with a 0.4% increase. This relative stability after several years of consistent growth, demonstrating resilience within the sector during a tumultuous period.



Figure 14: Total number of patents granted and the cumulative patent portfolio across all providers for each academic year from 2014/15 to 2020/21.

41. Consideration of the identity of the party filing the patents is also of interest and is illustrated in Figure 15. The number of patents filed by external parties naming the HEP as an inventor continued to increase in 2020/21 with a growth of 8.7% to 2,906 compared to 2019/20. Despite an overall decrease in the number of patents filed by providers in 2020/21, the broader trend across all reporting periods examined indicates that strategic filing activity by HEPs may be remaining relatively consistent. These observations continue to suggest the way in which providers are managing their patent portfolios may be shifting, with a greater emphasis on filings by external parties.



Figure 15: Total number of patents granted, and total patents filed by providers and by external parties for each academic year from 2014/15 to 2020/21.

42. The proportion of providers which had a given number of patents granted in an academic year was also calculated and is shown in Figure 16. In 2020/21 the most notable changes compared to 2019/20 were that the proportion of providers with zero patents granted was relatively stable at 61% following an increase from 55% of providers in 2019/20. Given that there have been no significant changes across the sector, it is not unexpected that the sector's patenting profile has also been relatively stable in the short to medium term.



Figure 16: Proportion of the total number of providers that has a given number of patents granted each academic year from 2014/15 to 2020/21.

43. However, of note is that of the seven providers granted the greatest number of patents in 2020/21 (Universities of Oxford, Cambridge, Manchester and Leicester, King's College, University College London, and Imperial College), four saw considerable increases in 2020/21 as displayed in Figure 17.



Figure 17: Total number of patents granted across the whole sector, and for individual providers, for each academic year from 2014/15 to 2020/21.

44. It is important to be mindful when discussing patent data that, in some cases, trends may be reflective of a provider's strategic approach to IP, rather than being indicative of a provider not producing potentially patentable IP.

Spin-out company formation

- 45. For the purpose of this report, a spin-out is defined as a company which exploits intellectual property arising from a university.
- 46. After a slow rate of increase in 2019/20, spin-outs overall continued to perform well across all measures in 2020/21, demonstrating resilience despite instability caused by

the Covid-19 pandemic. Figure 18 demonstrates the continued increase in the total number of newly registered spin-outs of 12.4% (165 spin-outs) in 2020/21, and the increase in active spin-outs to have survived at least 3 years of 13.4% (121 spin-outs). This increase is particularly significant following the decrease in spin-outs surviving at least 3 years in 2019/20 of 0.4% (4 spin-outs).

47. Although the above observations can provide indications of performance trends at an institutional level, these should be treated with caution as there is significant variance year-to-year in spin-out data. When analysing numerical spin-out data, the number that have survived at least three years can provide a better insight into performance, and the overall increase in 2020/21 indicates an increase in quality of spin-outs.

Figure 18: Total number of active spin-outs to have survived at least three years and the total number of newly registered spin-outs in the reporting periods for English HEPs, each academic year from 2014/15 to 2020/21.



Active Spin Outs 3 Year+ —— New Spin Outs

- 48. The estimated external investment from all sources received by all spin-outs totalled across the sector continued to increase in 2020/21, and at a notably increased growth rate of 116%, resulting in external investment of £5.12bn. This compares with the £2.4bn of external investment in 2019/20, which represented a 47% increase on 2018/19. The ability to attract equity increased investment may also be interpreted as indicative of the quality of spin-outs across the sector continuing to increase. However, it is important to note that a relatively small number of providers contribute to these figures and therefore broader trends are heavily influenced by changes at an individual provider level, as demonstrated in Figure 19. The increased growth rate was driven by a significant increase in external investment associated with the University of Cambridge. This is likely due to dramatic changes in collection practice rather than a significant increase in activity. The growth rate for the rest of sector is 28%.
- 49. There was a decrease in 2020/21 in the proportion of total estimated external investment due to the highest six providers (see Figure 19) which accounted for 83% in 2020/21 compared to 85% 2019/20. Notable relative changes can be seen in the increase in the estimated external investment from all sources received by spin-outs at the University of Cambridge and The Institute of Cancer Research, with increases of 550% (£1.03bn) and 1,230% (£285m) respectively. However, some caution should be taken using external investment as a value proxy when differentiating activity across the sector due to the investment needs across types of spin-outs varying significantly depending on their sector.

Figure 19: Estimated external investment received by all spin-outs totalled for all providers, and for individual providers, for each academic year from 2014/15 to 2020/21



50. The total estimated current employment of all active firms may also be used as a partial indicator of the success of the spin-outs across the sector (although it should be noted that it is a poorer proxy for performance due the differing staffing requirements of different types of businesses). The year-on-year change in this metric is depicted in Figure 20 below, alongside that for the total estimated external investment and total number of currently active spin-outs that have survived at least three years. While Table 1 displays the absolute values for these three indicators for the last three reporting periods.



Figure 20: Year-on-year % change in the three spin-out metrics from 2015/16 to 2020/21.

Table 1: Estimated employment, estimated external investment, and number of currently active spin-outs to have survived at least three years, for the most recent three reporting periods.

Spin-Out Metric	2018/19	2019/20	2020/21
Estimated Employment	17,935	20,260	32,481
Estimated External Investment / £Bn	1.62	2.39	5.17
Currently Active Spin-Outs to have Survived at Least 3 Years	908	904	1025

51. Estimated employment and estimated external investment exhibited continued growth in 2020/21, and at a greater rate than in 2019/20. However the significantly greater growth

can predominantly attributed to very large increases at the University of Cambridge (which are partially a reflection of significant changes in data collection practices). As discussed previously, there was also a notable increase in the number of active spinouts to have survived at least three years increased in 2020/21. It should be noted that all three of these indicators are highly influenced by institutional changes as only a few providers account for the bulk of these trends. However, these observations are indicative of continued increase in overall spin-out quality as they are attracting more business investment suggesting more confidence from business, employing more people, and creating more jobs.

Comparison of England with the UK

- 52. It is also of interest to compare trends in IP income in the England to that of the UK and other devolved nations in more detail. There was a notable difference between the year-on-year changes in IP income for England and that of the UK, as displayed in Figure 21, which displays total IP income for the UK as a whole, and each nation individually. Although both England and the UK observed decreases in IP income in 2020/21, this was more significant for England with a decrease of 11.3% compared with 3.5% in the UK.
- 53. The difference between IP income in England and in UK is driven predominantly by contrasting increase in IP income in Scotland in 2020/21 of 361% (£52.2m) compared to 2019/20. This is primarily due to a significant increase in sale in shares in spin-outs for the University of Dundee, totalling £40.5 million, representing a year-on-year increase of 39,900%. This should be treated with caution as changes in the sale of shares in spin-outs can be unpredictable and does not necessarily reflect the broader shifts in overall IP income.
- 54. The overall trend in IP income for England and the UK since 2014/15 is broadly very similar as depicted by the trendlines in Figure 21. This could be argued to be the more representative measure of IP income due to the large fluctuations that can occur at an institutional level year-on-year as a result of the sale of shares in spin-outs.



Figure 2: Total IP revenue for the UK and the devolved nations for each academic year from 2014/15 to 2020/21.

55. While these figures do show differences between the nations of the UK, it is important to be mindful of the relatively small number of providers outside of England. When the total IP income for each nation is normalised by their respective total number of providers, similar trends and therefore performance is observed across England, Wales, and Scotland and therefore are more similar to that of the UK overall, as illustrated in Figure 22. The significant increase in total IP income per provider in Scotland in 2020/21 is likely distorted by the significant sale of shares activity at the University of Dundee as previously discussed. However, total IP income per provider in Northern Ireland was significantly greater than that of any other nation and the UK, other than in 2020/21 and 2018/19. This level of activity has previously been dictated by fluctuating income to Queen's University Belfast (see below).

Figure 3: Total IP revenue per provider for the UK and the devolved nations for each academic year from 2014/15 to 2020/21.



56. The relatively small number of providers outside of England also means that institutional changes have a greater effect on the broader trends in the devolved nations as demonstrated in Figure 23. The total IP income for Queen's University Belfast is almost equal that of the Northern Irish total, and similarly the total IP income for Wales is predominantly that of Cardiff University. The total IP income for Scotland is usually less dependent on individual institutional changes, but Figure 23 demonstrates the significant increase and therefore driving effect of income for the University of Dundee 2020/21. Changes in total IP income are often highly variable in nature due to the effect of year-to-year sales of shares, however individual providers have less of an individual impact in England due to the greater total number that generate revenue through IP.



Figure 234: Total IP revenue for Scotland, Wales, Northern Ireland, and the relevant providers for each devolved nation for each academic year from 2014/15 to 2019/20.

IP-Related International Comparisons

- 57. Commercialisation activities in the UK can be compared with that in the US by comparing HE-BCI data and elements of the OfS Annual Finance Return, with the US AUTM Licensing Survey. Reasonable caution should be taken when comparing this data, because the US AUTM surveys, UK OfS Annual Finance Returns and HE-BCI surveys are not identical, where different definitions and accounting periods are used.
- 58. UK data are collected by official bodies, HESA and the OfS. These data undergo a more comprehensive validation than data collected from the USA, which are submitted to sector-representative bodies.
- 59. As the number and size of higher education institutions (HEIs) varies between nations, some indicators are normalised using a measure of 'total research resource' (income from all sources to undertake research in the UK, or expenditure on research in the US). For example, the total research resource available is divided by the number of patents granted to give an indication of the research resource required per patent granted.
- 60. Comparisons of the UK and US data should be treated with caution. HESA/OfS data included in our analysis represents the entire UK HEI sector whereas the AUTM data used consists of a self-selected group (in 2020/21, 157 of the approximate 1,400 that comprise the whole sector). Consequently, the identity of the institutions contributing data varies each year, including institutions with high volumes of activity and can make not insignificant contributions to the data. Thus, comparisons year-on-year should be treated as approximations.
- 61. With these caveats in mind, Table 2 below demonstrates that the UK is broadly comparable with the US when research resource is taken into account. Total research resource for the UK and US increased in 2020/21. In both nations there has been an increase in the numbers of spin-out companies formed and the numbers of patents granted.
- 62. There continues to be significant growth in the number of spin-outs of 11.5% in the UK compared in contrast with only a 5.9% increase in the US in 2020/21 (also following a 5.3% decline in 2019/20 in the US). Following the growth also observed in 2018/19 and 2019/20 in the UK, this continues to perhaps indicate the time lag between research and commercialisation activity after a reduction in spin-out activity in previous years. The research resource per spin-out in the UK has also continued to decrease in 2020/21 in line with this growth in absolute spin-out numbers.

- 63. In addition, the UK's patenting activity continued to perform well against the US in 2020/21 with an 8.6% growth compared with 1.5% increase in the US. The research resource per patent of £4.2 million remains lower in the UK than the £6.5 million for the US although changes from 2018/19 should be considered in light of the changes in research resource in both sectors. As a proportion of total research resource, industrial contribution in the UK continues to compare well with the US, although UK has seen a decrease in the proportion of research resource from industry.
- 64. There was a decrease in overall income from commercialisation activities in the UK in 2020/21, whereas IP income in the US increased following previous years of notable decline. The comparison of IP income is discussed in more detail below. However, it will be important to monitor the continued relative performances of the two nations due to the lag between research and commercialisation activities that can often occur. Although there was a decrease in research resource in the UK in 2019/20, it is unlikely that this will have yet resulted in a material change in commercialisation activity.
- 65. Whilst comparisons of the concentration of IP income in the US and UK are not straightforward, below is our attempt at analysing the two datasets. There are a number of caveats to this analysis which are discussed in more detail. There may be also be further alternative ways of doing this not discussed here, such as comparing groups of universities with similar characteristics.
- 66. One consideration is again the self-selection of institutions that report to AUTM, as this sample potentially represents more providers that conduct a larger amount of IP-related activity and therefore are more likely to opt to submit data. However, it is a reasonable assumption that most institutions in the US sector with significant IP incomes will have opted to report to the AUTM licensing survey, and therefore comparing an absolute number of institutions in the UK and the US serves as a reasonable approximation for comparing the distribution of activity amongst those who are likely to be active in this area. In addition, the differing size and nature of research funding in the UK and US should be considered. The distribution of IP income in both countries is generally concentrated in large, research-intensive institutions. When considering an equal sized sample from each sample, Figure 24 below demonstrates that this concentration of IP income is more apparent in the UK. In 2020/21, 74% of the UK's IP income was to 6 institutions compared with 41% to 6 institutions in the US. It should be noted that this sample reflects only a small proportion of the US sector, in comparison to the UK, and therefore overall, it is likely that the concentration of IP income across the whole sector in the US is more pronounced than in the UK.



Figure 24: IP income per institution, for the 75 institutions with the greatest IP incomes, as a percentage of its sector total for the UK and the US in 2020/21.

- 67. The IP income for each institution can be normalised by its research resource in order to provide a more balanced comparison of the concentration of IP income in the US and UK sectors. Figure 25 suggests that when the structural differences of institutions are taken into account, IP income in 2020/21 remained slightly more concentrated in the UK than the US based on the institutions submitting data.
- 68. When comparing this analysis to that in <u>our previous publication</u>, it is important to emphasise that the identity of the institutions submitting to AUTM varies year-on-year and therefore can contribute to any changes in trends. Although there are a few outlying institutions in the UK sector, overall more UK institutions achieve a greater return in IP income for the available research resource compared to the US.

Figure 25: IP income per institution normalised by its individual research resource in 2020/21, for the 50 institutions with the greatest normalised IP incomes, in the UK and the US.



69. Additional and more detailed information, for example, on US-UK comparisons on investment income raised by spin-outs is in the data report to the <u>Mike Rees review</u>.

Table 2: Commercialisation activity for the US and UK 2015/16-2020/21.

	US (AUTM)					UK (HE-BCI and OfS Annual Finance Record)						
	FY 2020	FY 2019	FY 2018	FY 2017	FY 2016	FY 2015	AY 2020/21	AY 2019/20	AY 2018/19	AY 2017/18	AY 2016/17	AY 2015/16
Total research resource (£M)	48,262	45,033	43,252	42,188	41,768	40,132	8,823	8,495	8,624	8,203	7,894	7,845
IP income including sales of shares in spin-outs (£M)	1,162	919	995	1,345	1,248	1,240	285	295	269	207	148	176
IP income as percentage of total research resource	2.4%	2.0%	2.3%	3.2%	3.0%	3.1%	3.2%	3.5%	3.1%	2.5%	1.9%	2.2%
Spin-out companies formed	1,010	954	1,007	991	950	946	194	174	162	142	143	171
Research resource per spin- out (£M)	47.8	47.2	43.0	42.0	43.3	42.4	45.5	48.8	53.2	57.8	55.2	45.9
Patents granted	7,450	6,659	6,761	6,751	6,385	6,124	2,078	2,027	1,867	1,770	1,386	1,219
Research resource per patent (£M)	6.5	6.8	6.4	6.2	6.4	6.6	4.2	4.2	4.6	4.6	5.7	6.4
Industrial contribution (£M)	3,139	2,931	2,904	2,868	2,909	3,000	638	685	699	651	635	604
% industrial research	6.5%	6.5%	6.7%	6.8%	7.0%	7.5%	7.2%	8.1%	8.1%	7.9%	8.0%	7.7%
US cashed-in equity/UK Sale of spin-out shares (£M)	125.2*	82.3	51.1	45.9	158.7*	45.9	87.6	83.5	61.4	44.6	36.4	35.8

'FY' = 'Financial year'; 'AY' = 'Academic year'; 'IP' = 'intellectual property'. *This figure is due to a single institution reporting a significantly increased equity for this year only.

Further notes on Table 2 data

- 70. The exchange rate used is the Purchasing Power Parity (PPP) adjusted exchange rate published by the OECD (see <u>https://www.oecd.org/sdd/prices-ppp/</u> for more information). The US dollar (\$) to GB Pound (£) conversions for 2015 2020 are summarised below:
 - 2015: \$1.444 to £1
 - 2016: \$1.452 to £1
 - 2017: \$1.465 to £1
 - 2018: \$1.455 to £1
 - 2019: \$1.462 to £1
 - 2020: \$1.451 to £1.
- 71. Note that previous international comparisons published by HEFCE in 2017 used a different methodology and as such, the published numbers for AY15-16 will differ slightly from those presented here.
- 72. We use data from the AUTM Statistics Access for Technology Transfer database, for US universities only, AUTM category 5U excluding hospitals and institutes that appeared in this category for 2019 only in order to maintain reasonable consistency with previous years.
- 73. AUTM allows for confidential returns, which have been excluded from the figures presented here. Their exclusion does not have a significant effect on the key indicators.
- 74. The start-up companies defined in the AUTM survey are those dependent on institutions' technology for initiation and so are equivalent to the spin-out companies recorded in the HE-BCI survey. Research expenditure is taken over the fiscal years and is taken as being the available resource for US universities.
- 75. Income from cashed-in equity is recorded in the AUTM survey and is assumed to be broadly equivalent to the income from the sale of shares in spin-out companies collected in the UK HE-BCI survey. For further information about the AUTM survey see <u>https://autm.net/surveys-and-tools/databases/statt</u>



- 76. The total number of UK HEI spin-out companies in Table 2 is derived from the HE-BCI survey, including those companies with some HEI ownership and those that use HEI-generated IP (formal spin-outs).
- 77. UK HEIs are free to use their total (research and teaching) block grant funds from funding councils for either research or teaching as they feel appropriate. Since full expenditure details for the block grant are not collected, it is assumed in this calculation that all of the research block grant funds and other research income are spent on research.
- 78. For the UK, HESA data on research income from industry, commerce and public corporations from UK and overseas sources is used to give the industrial contribution. For US universities, expenditure from industry is used.