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

An update for the period 2015/16 – 2018/19

A technical note for Research England

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1 Introduction

This short note presents an updated assessment of the gross additional impacts of the Higher Education Innovation Fund (HEIF) managed by Research England. It largely replicates the core analysis in Ulrichsen (2015) that estimates the additionality of HEIF using the expert assessments of attribution of knowledge exchange (KE) impacts to HEIF provided by senior KE leaders.

The analysis focuses on the period 2015/16 – 2018/19, acknowledging the important time lags between Higher Education Institutions (HEIs) investing HEIF to support their KE activities and the impacts of these investments materialising (Hughes and Martin, 2012; Ulrichsen, 2015).

Following the precedent established over the past decade, the analysis uses KE income to the HEI as a *proxy* for the impact resulting from its knowledge exchange activities. While imperfect, this proxy is based on the reasonable assumption that external partners in the private, public and third sectors are rational and will only pay to engage in KE with HEIs if they believe that the benefits from their investments at minimum outweigh the costs. As such KE income represents a reasonable minimum bound of the impacts realised¹.

Due to time constraints I do not re-run the regression models developed in Ulrichsen (2015) to estimate the return to investment of HEIF. Previous analyses of this type have found a positive and statistically significant relationship between HEIF investment per academic and the amount of KE income per academic generated by an institution (Ulrichsen, 2015, 2014). Further, the returns to HEIF investment estimated through these regression analyses were broadly similar to those based on expert assessments of attribution.

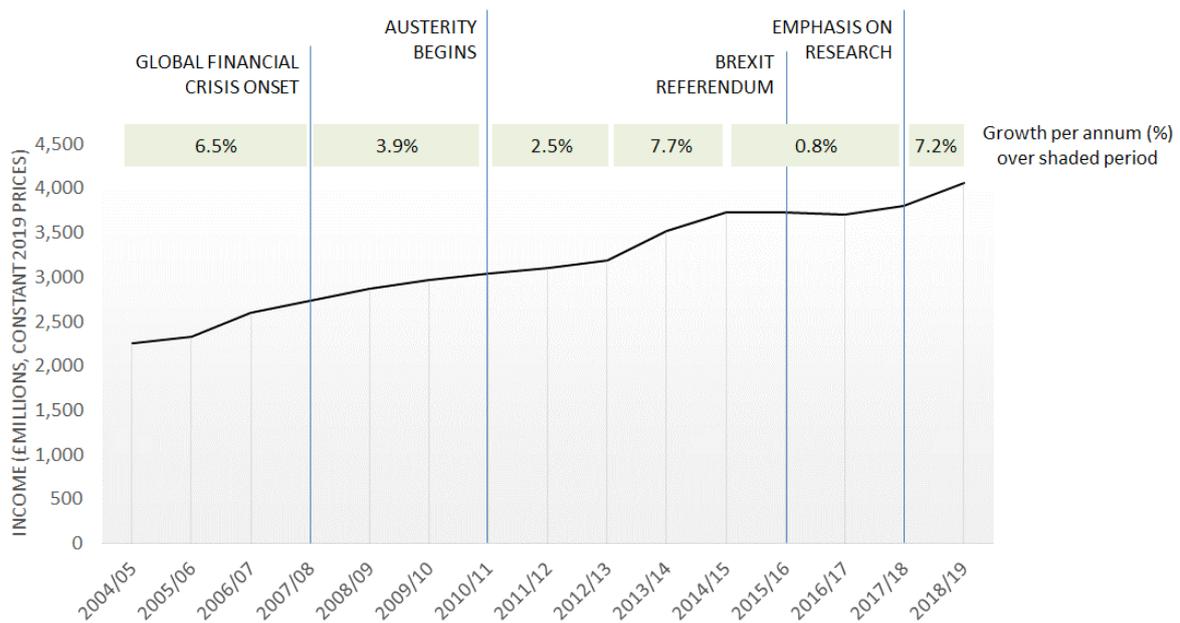
The note is structured as follows. The first section presents key trends in KE income for the English HE sector. It then focuses on those HEIs in receipt of HEIF funding from 2016/17 onwards. The note proceeds to set out the estimates of KE income attributable to HEIF, and the resulting ROI. The analysis undertaken at three levels: for all English HEIs in receipt of HEIF; for the different KEF clusters; and for different regions. The note also explores the addition of a measure for proxying the impacts of spinouts emerging from HEIs.

2 Key trends in knowledge exchange income

This first section looks at key trends in KE income for English HEIs over the period 2004/05 to 2018/19. Over this period KE income has increased (in constant 2019 prices) by 80% from £2.2 billion to £3.99 billion (Figure 1). The figure also presents the annualised growth rates for different periods and identifies key macroeconomic events that will have had an impact on KE activity. It suggests that the English HE sector experienced a period of reduced growth in KE following the global financial crash of 2008. Following a surge in KE income between 2012/13 and 2014/15, growth in KE activity stagnated in the run-up to the Brexit referendum and for two years afterwards. 2017/18 – 2018/19 saw another surge in KE income growth.

¹ A fuller discussion of the use of KE income as a proxy for impact can be found in Ulrichsen (2016)

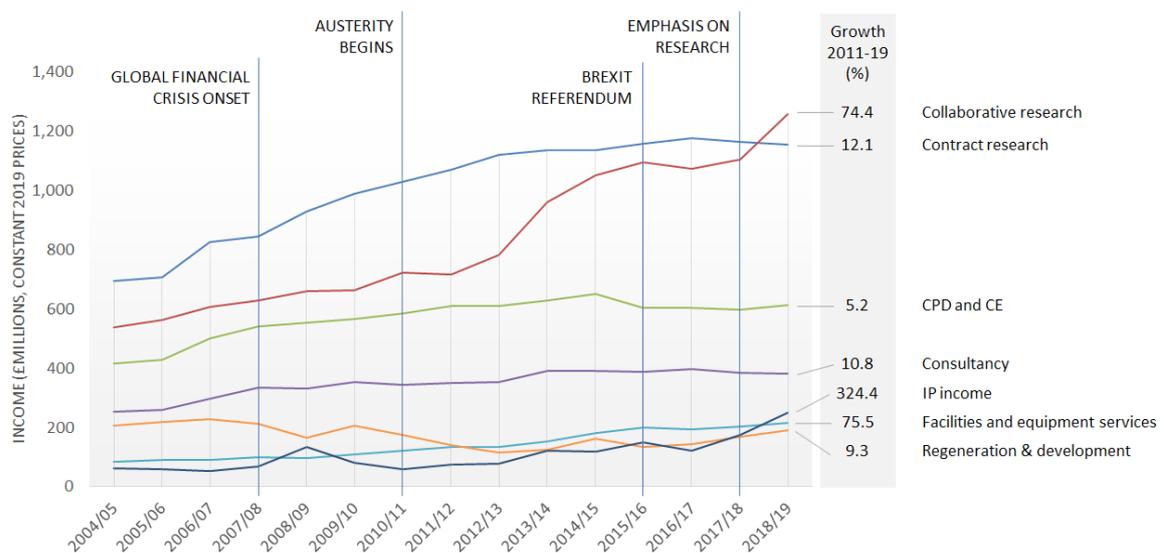
Figure 1 Knowledge exchange income trends 2004/05 – 2018/19



Sources: HEBCI surveys, HESA

Understanding possible drivers for these changes benefits from delving more deeply into the trends in different components of KE income (Figure 2, Figure 3). These figures reveal suggest some important switching in preferences for different types of KE not least from contract research to more collaborative forms of research which leverages both public and non-public funding sources (Figure 2). Further income from intellectual property (IP, including sale of shares in spinoffs) has risen significantly in recent years, while income from facilities and equipment services has showed steady growth from 2007/08 to 2015/16. Concerning though is the stagnation in continuing professional development and provision of consultancy services in recent years; both important conduits for helping external partners solve technical problems and build capabilities to innovate and compete.

Figure 2 Knowledge exchange income trends, by mechanism 2004/05 – 2018/19

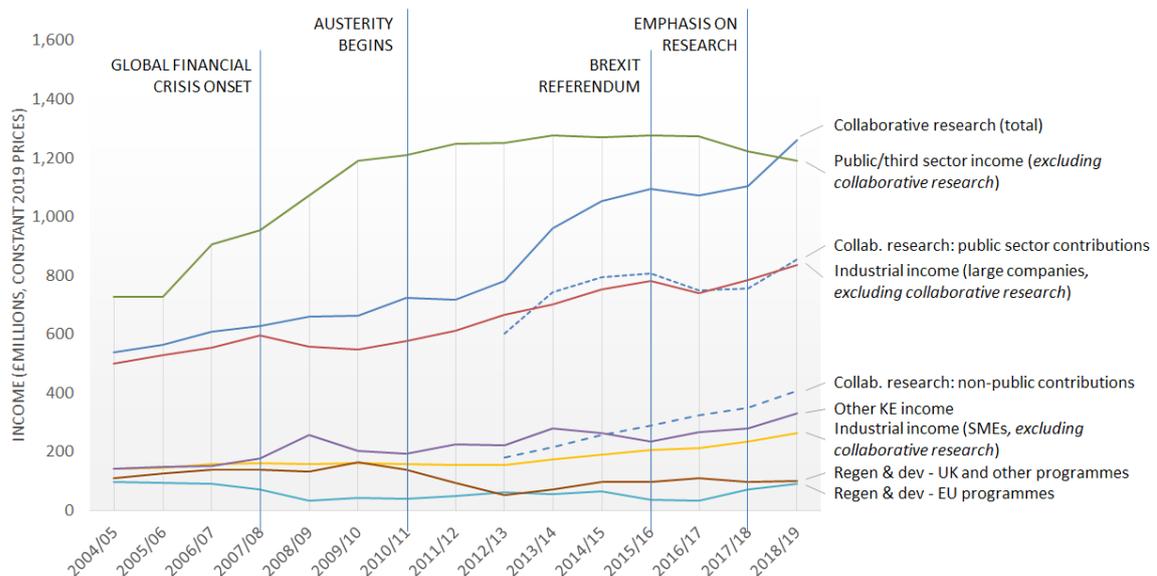


Sources: HEBCI surveys, HESA

Figure 3 explores the trends by partner type, separating private vs public/third sector partners. It starkly reveals the effects of public sector austerity policies on the commissioning of KE services (excluding collaborative research) by public/third sector organisations from HEIs. Prior to 2010/11 income from these sources was growing at a fast rate. By contrast, KE income from the large companies in the private sector (excluding collaborative research) stagnated for two years after the 2008 financial crash before beginning a period of steady growth until 2016/17. Growth in this source of income appears to have been affected by the unexpected and disruptive result from Brexit referendum and the uncertainty that followed. KE income from private sector small and medium sized enterprises (SMEs) stagnated for much longer post 2008, with growth only restarting in 2012/13.

What is also clear from Figure 3 is the significant investment by the public sector on investing in collaborative research, which leverages non-public sources, between 2012/13 and 2014/15. Interestingly, while the public sector contributions stagnated between 2015 and 2018, contributions (cash or in-kind) from non-public sources has shown steady growth since 2012/13 until 2018/19.

Figure 3 Knowledge exchange income trends, by type of partner 2004/05 – 2018/19



Sources: HEBCI surveys, HESA

2.1 Distribution of KE income across different KE infrastructure categories

English HEIs in receipt of HEIF funding are required to set out in their institutional KE strategies how their KE activities, and HEIF funding, are distributed across different areas of KE support. The framework for KE support infrastructure is shown in Figure 4 and identifies seven key categories in addition to leadership and strategy and internal capability building.

Figure 4 KE support infrastructure categories

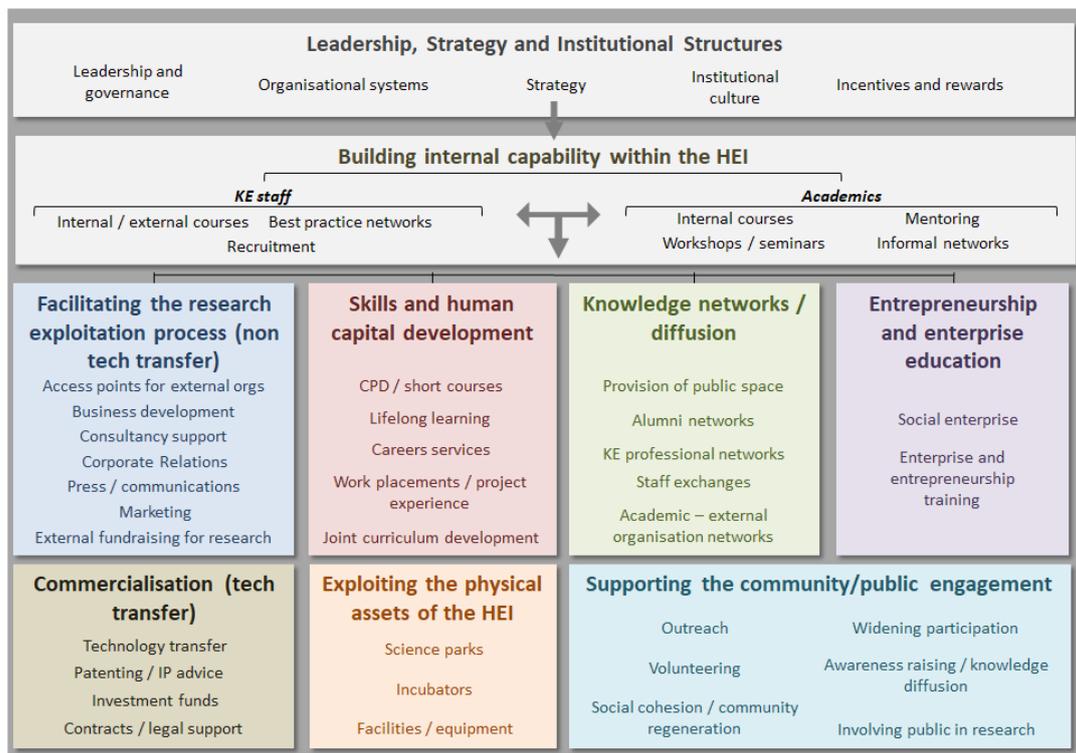
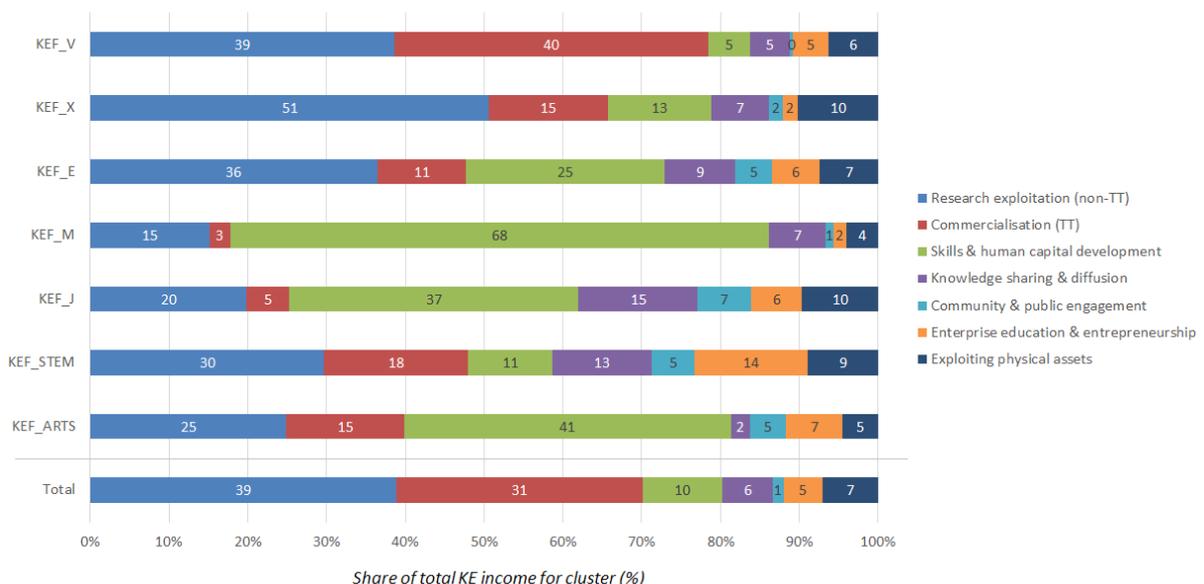


Figure 5 presents the distribution of KE income received by HEIs in different KEF clusters across the different KE support infrastructure categories. It shows the dominance of research- and commercialisation related KE for HEIs in Cluster V and to a lesser extent Cluster X. By contrast KE income associated with skills and human capital development dominates for Cluster M and forms a significant proportion of income for Cluster J and the specialist Arts institutions.

Figure 5 Knowledge exchange income associated with different KE support infrastructure categories, 2015/16 - 2018/19



Sources: HEBICI surveys, HESA and HEIF institutional strategies for knowledge exchange 2016/17

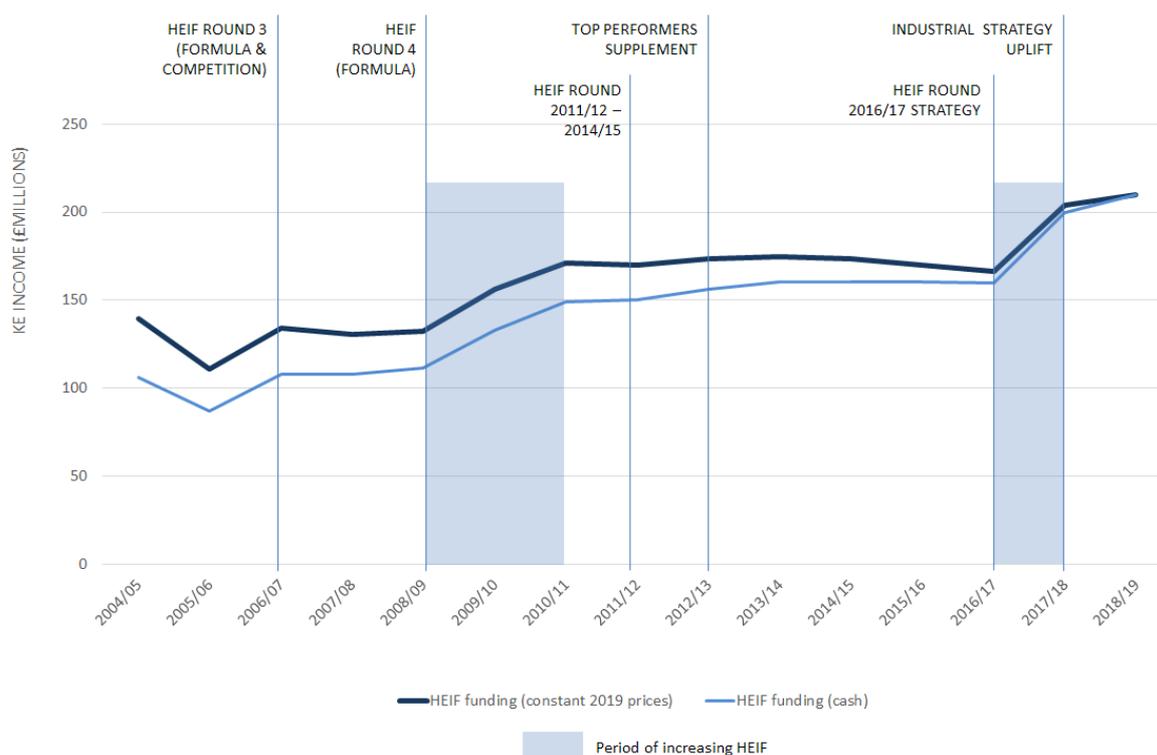
3 Key trends in the investments in knowledge exchange made through HEIF

3.1 Long term trends in HEIF investments

HEIF funding invests in English HEIs to support and incentivise them “to work with business, public and third-sector organisations community bodies and the wider public, to exchange knowledge and increase the economic and societal benefit from their work”². Crucially, the fund aims to “support and develop a broad range of knowledge-based interactions between HEIs and the wider world, which result in economic and societal benefit to the UK”³.

The long term trends in investments in KE made through the core HEIF programmes are shown in Figure 6 (in constant 2019 prices). This shows the periods of growth in funding during HEIF round 4 to £150 million per annum. A £10 million supplement for top performers was introduced in 2012/13. This level of £160 million per annum of HEIF investments was maintained until the recent increases to approximately £210 million for 2018/19. Funding has since been increased to £213 million in 2019/20 and will further increase to £230 million for 2020/21 in line with government’s commitment to increase funding to £250 million⁴.

Figure 6 Trends in HEIF funding and KE income 2004/05 – 2018/19



Sources: HEFCE and Research England circulars

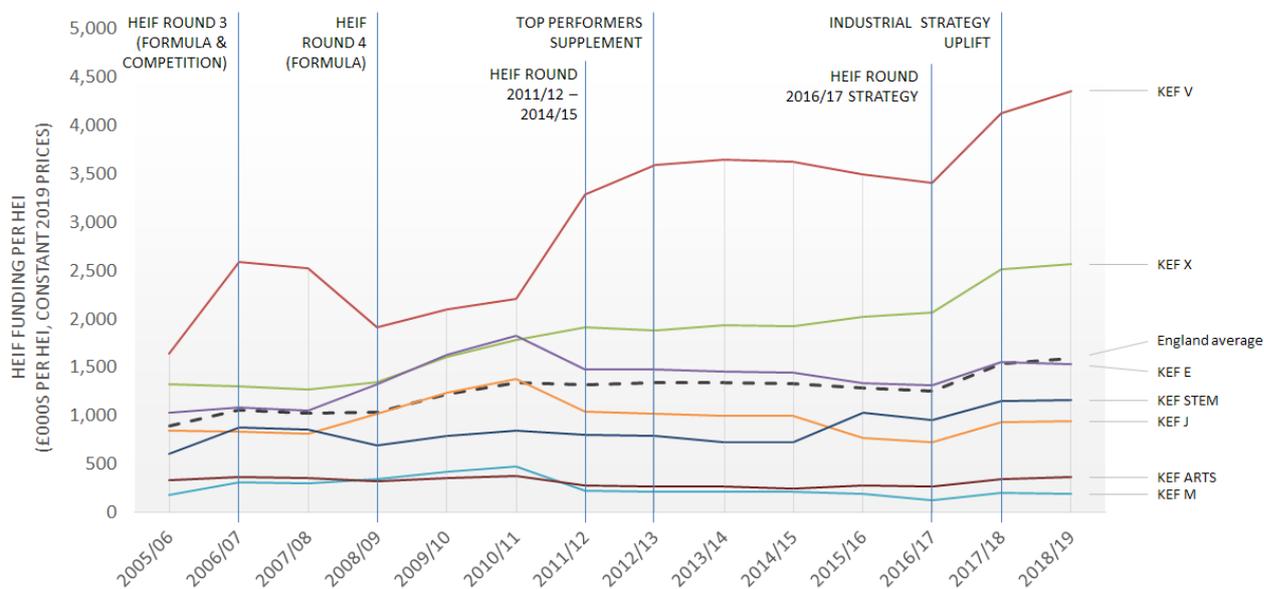
² <https://re.ukri.org/knowledge-exchange/the-higher-education-innovation-fund-heif/>, accessed on 3rd September 2020

³ Ibid.

⁴ <https://re.ukri.org/sector-guidance/publications/research-and-knowledge-exchange-funding-2020-21/>, accessed on 3rd September 2020

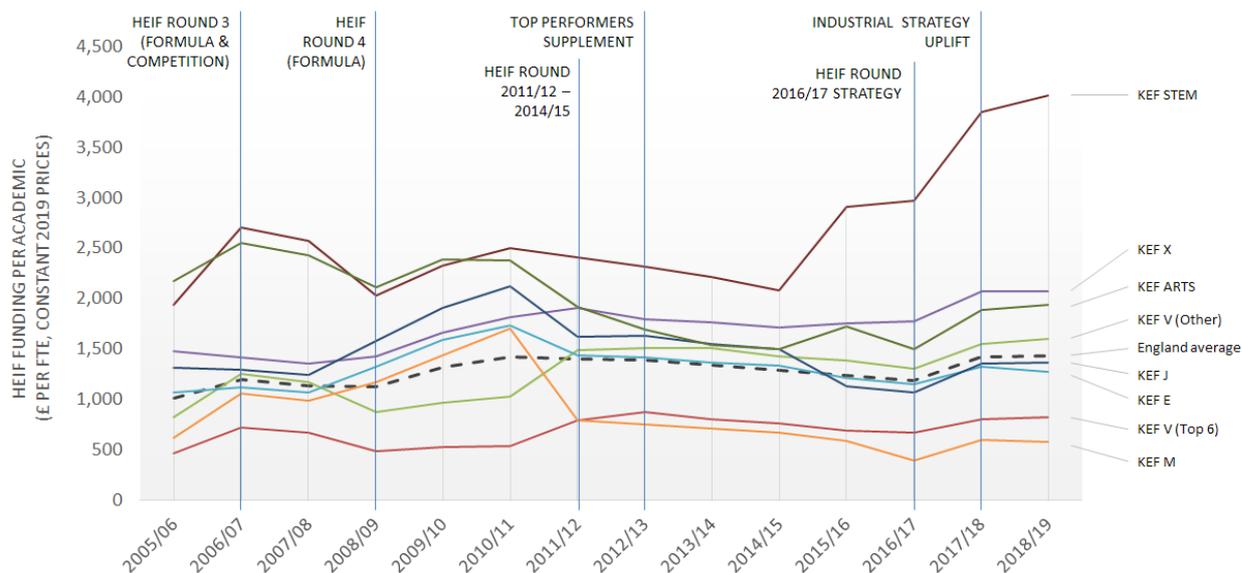
Figure 7 explores the trends in the average amount of HEIF funding per institution received by HEIs in each of the clusters of HEIs developed as part of the Knowledge Exchange Framework (KEF)⁵. This shows that the large research intensive HEIs in cluster V receive the most (with most HEIs within this cluster receiving the maximum amount possible). HEIs in cluster M and in the Arts cluster receive the least HEIF funding per institution.

Figure 7 Trends in HEIF funding per institution, by KEF cluster 2005/06 – 2018/19



Sources: HEFCE and Research England circulars

Figure 8 Trends in HEIF funding per academic, by KEF cluster 2005/06 – 2018/19



Sources: HEFCE and Research England circulars

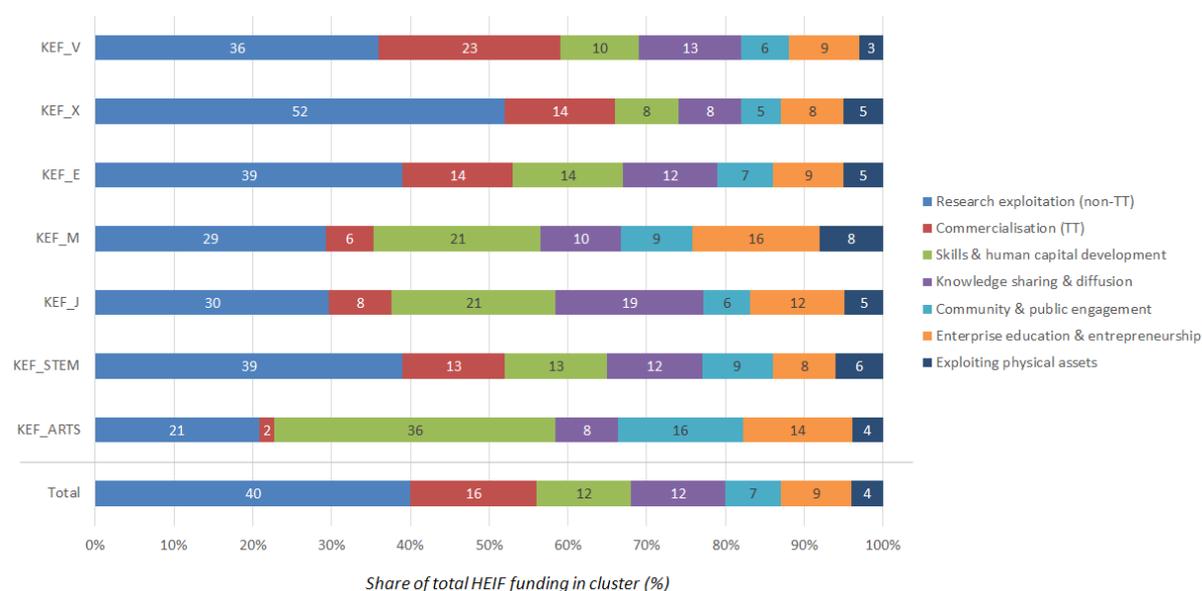
⁵ Available at <https://re.ukri.org/sector-guidance/publications/knowledge-exchange-framework-clustering-and-narrative-templates/>, accessed on 3rd September 2020

However this analysis hides the significant differences in scale of HEIs that are typical in each cluster. Figure 8 presents the average amount of HEIF funding per academic received by HEIs in each KEF cluster. In this figure I have separated cluster V into the largest six UK institutions (based on the number of academic FTEs)⁶ and other HEIs in the cluster. These six HEIs all receive the maximum amount of HEIF funding possible under the formula. However, when normalised by the number of full time equivalent (FTE) academics, they receive much less than the average for England. By contrast cluster X receives both higher than average HEIF per institution (Figure 7) and per academic (Figure 8).

3.2 Breakdown of HEIF investments by type of support

I now turn to what we know about HEIF funding is invested by English HEIs. Using the information provided by HEIs in annual monitoring statements over the three-year period 2016/17-2018/19, Figure 9 presents the distribution of HEIF by the type of KE support infrastructure it supports⁷. The types of KE infrastructure are based the framework set out in Figure 4.

Figure 9 *Distribution of HEIF funding across KE infrastructure categories, 2016/17 – 2018/19*



Sources: analysis of HEIF annual monitoring statements 2016/17 – 2018/19

Across English HEIs, 40% of HEIF in the recent period was invested in developing KE support for research exploitation (excluding technology transfer through spinouts and licensing); 16% was invested in support for commercialisation through spinouts and licensing; 12% in support for skills and human capital development; 12% for knowledge sharing and diffusion; 7% for community and public engagement; 9% for enterprise training and entrepreneurship; and 4% for supporting the exploitation of an HEIs’ physical assets Figure 9. The figure also shows considerable differences across the KEF clusters in how HEIs use their HEIF funding, likely reflecting both HEI-specific KE strengths and opportunities, as well as availability of other sources of funding. For example cluster V

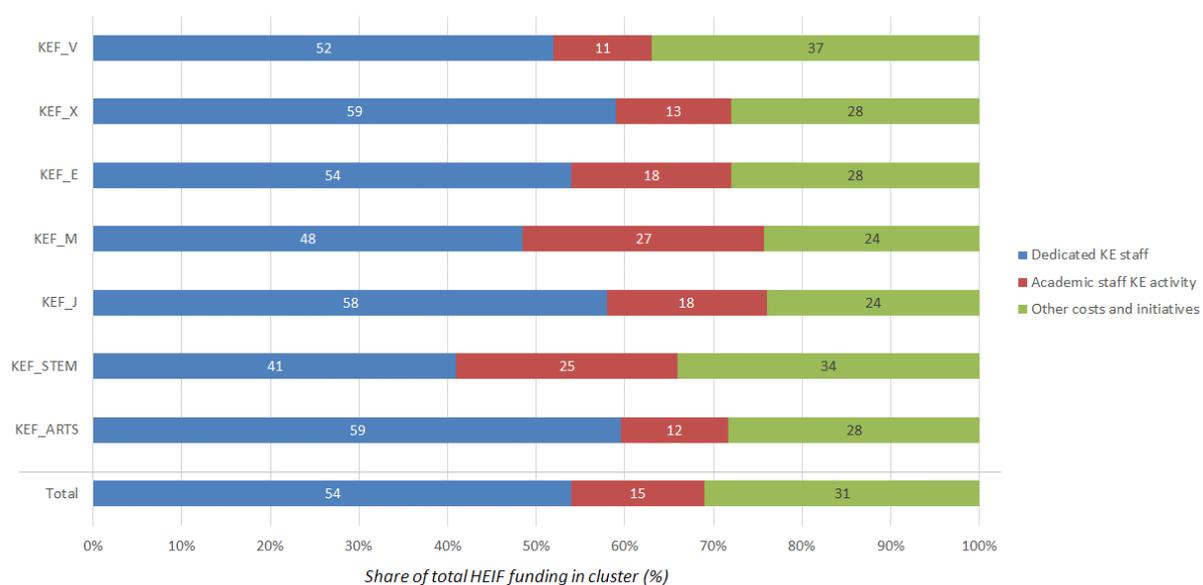
⁶ Oxford, Cambridge, UCL, Imperial, Manchester and King’s College London

⁷ Note that pre-2016/17 HEIF spending on the commercialisation through technology transfer and research exploitation (through other routes) were combined into a single category. As such the distribution of HEIF by category was analysed for the period 2016/17 – 2018/19.

and the STEM cluster invest the largest proportion of their HEIF funding in IP commercialisation support. This correlates strongly with the concentration of IP commercialisation activities within the sector in these HEIs (Figure 5). By contrast, the more teaching intensive HEIs in clusters M and J invest proportionately more in support for skills and human capital development related KE.

Figure 10 presents the distribution of HEIF by type of expenditure it supports.

Figure 10 Distribution of HEIF funding across types of KE expenditure, 2016/17 – 2018/19



Sources: analysis of HEIF annual monitoring statements 2016/17 – 2018/19

4 Assessing the impacts of HEIF funding

This section now turns to an assessment of the gross additional impacts of HEIF funding. It replicates the method from the Ulrichsen (2015) using expert judgements in assessing the gross additionality of HEIF. The analysis follows precedence in using KE income as a *proxy* for impact, recognising that the external partners are unlikely to be willing to pay for KE services unless they realise value to their organisation that at least exceeds the costs of engagement.

This section updates the 2015 analysis using the latest data on attribution from the 2016-17 institutional KE strategies submitted to Research England (then the Higher Education Funding Council for England) as part of the HEIF allocation process, and latest KE income and HEIF funding data covering the period 2015/16 – 2018/19. A key element of the institutional KE strategy submission by universities was an estimation of the association of their KE outputs to KE infrastructure categories, and, based on their expert judgements, the proportion of these outputs that were attributable to HEIF investments in these infrastructure categories. These data inform analysis below. Due to time constraints the regression models were not reconstructed.

4.1 Association of KE outputs with different types of KE infrastructure

Estimating the gross additionality of HEIF requires that we first allocate KE outputs to each of the key KE support infrastructure categories, using HEIF strategies data. This is shown in Table 1. It reveals that the majority (52%) of the income based KE metrics available in HEBCI are concentrated in the

‘research exploitation (non-TT) category. A further 14% of measurable KE income is associated with the skills and human capital development category (largely due to CPD and CE although some regeneration and development programmes are also linked to this category), while 12% is associated with commercialisation (TT) support (driven largely by IP licensing revenues). Much of the income associated with exploiting the physical assets of an HEI derives from facilities and equipment services, although regeneration and development programmes contribute 17% to this category.

Table 1 *Distribution of income-based KE mechanisms across KE infrastructure categories*

Income-based KE metrics	% income in each KE infrastructure category							Total over period 2015/16 – 2018/19 (£ millions)
	Research exploitation (non-TT)	Commercialisation (TT)	Skills & human capital development	Knowledge sharing & diffusion	Community & public engagement	Enterprise education & entrepreneurship	Exploiting physical assets	
Collaborative research	73	10	2	6	1	2	5	4,505
Contract research	71	10	1	9	0	0	8	4,631
Consultancy	43	17	8	23	3	2	5	1,535
Facilities and equipment-related services	22	3	1	2	3	0	67	787
Continuing professional development	5	1	76	8	3	6	1	2,250
Regeneration and development programmes	30	6	19	10	7	11	17	615
Licensing and intellectual property	18	79	1	2	0	1	0	687
KE income	52	12	14	9	2	2	9	15,009

Sources: HEBCI surveys, HEIF annual monitoring statements, HEIF 2016/17 institutional strategies for knowledge exchange

Table 2 *Distribution of key commercialisation metrics across KE infrastructure categories*

Key commercialisation metrics		% income in each KE infrastructure category							Total over period 2015/16 – 2018/19
		Research exploitation (non-TT)	Commercialisation (TT)	Skills & human capital development	Knowledge sharing & diffusion	Community & public engagement	Enterprise education & entrepreneurship	Exploiting physical assets	
Number of companies established	IP-based spinoffs (HEI owned & formal)	5	88	1	1	1	2	2	475
	Staff start-ups	8	32	2	3	2	50	3	187
	Graduate start-ups	4	11	12	3	5	59	7	12,394
External investment (total in £ millions)	IP-based spinoffs (HEI owned & formal)	3	94	0	0	0	1	2	4,872
	Staff start-ups	14	46	2	2	2	34	0	86
	Graduate start-ups	0	12	1	0	1	81	5	801
Licensing (total in £ millions)	Licensing and intellectual property	18	79	1	2	0	1	0	14,372
Process metrics	Invention disclosures	10	82	3	0	0	4	0	6,683
	Patent applications	6	89	1	0	0	2	0	5,001
	Patents granted	8	88	1	0	0	2	0	16,600
	Patent portfolio	9	88	1	0	0	2	0	475

Sources: HEBCI surveys, HEIF annual monitoring statements, HEIF 2016/17 institutional strategies for knowledge exchange

Table 2 presents key commercialisation metrics and how they associate with different KE support infrastructure categories. Unsurprisingly much of the IP-based spinoffs (and linked external investment in them), IP process metrics (disclosures and patent applications) and IP licensing activity is associated with the commercialisation (TT) category. By contrast graduate start-ups (and associate external investment) falls primarily to the enterprise education & entrepreneurship category. Staff start-ups is split more evenly between these two categories.

4.2 Attribution of KE outputs to HEIF funding by KE infrastructure category

Table 3 *KE income attributable to HEIF funding by KE infrastructure category over period 2015/16 – 2018/19**

KE infrastructure category	Income (£million)	Income attributable to HEIF (£million)	% Income attributable to HEIF	HEIF funding (£million)	Return to HEIF investment†
Research exploitation (non-TT)	7,822	2,615	33.4	297	8.8
Commercialisation (TT)	1,809	816	45.1	120	6.8
Skills & human capital development	2,084	394	18.9	92	4.3
Knowledge sharing & diffusion	1,313	271	20.7	87	3.1
Community & public engagement	282	62	21.9	48	1.3
Enterprise education & entrepreneurship	360	139	38.5	69	2.0
Exploiting physical assets	1,338	244	18.3	32	7.7
Total	15,009	4,542	30.3	745	6.1

* Number of HEIs = 96 of 97 submitting institutional KE strategies as part of HEIF allocation process in 2016-17. One HEI failed to submit an estimate of attribution and had to be excluded from the analysis.

† Ratio of attributable KE income to HEIF funding

Sources: HEBCI surveys, HEIF annual monitoring statements, HEIF 2016/17 institutional strategies for knowledge exchange

The HEIF strategies provide estimations by universities on what proportion of outputs associated with each KE support infrastructure category could be attributable to HEIF – i.e. what proportion of KE outputs would likely not be generated in the absence of HEIF. Table 3 presents this information for all English HEIs in receipt of HEIF, along with the amount HEIF funding being invested in each category. The analysis is based on the total investments made over the period 2015/16-2018/19.

Overall, the data suggests that 30.3% of KE income is attributable to HEIF funding. This varies from 33.4% for research exploitation (non-TT), 45.1% for commercialisation (TT), 38.5% for enterprise education and entrepreneurship support, 18.9% for skills and human capital development and 21.9% for community and public engagement.

Table 3 further provides estimates of ROIs by KE infrastructure categories. It suggests the ROI for *research exploitation (non-TT)* is 8.8, exploiting physical assets is 7.7, and commercialisation through TT is 6.8. By comparison for skills and human capital development the ROI is 4.3.

However, I would advise caution in overly interpreting these differences in ROIs by KE infrastructure category as differences in performance of HEIF in these different areas. The robustness of using income as a proxy for impact will vary considerably by category with the proxy likely to capture *proportionally less* of the impacts for categories such as *community and public engagement* and *knowledge sharing and diffusion* categories than for the more transactional categories of *exploitation of research (non-TT)* (e.g. collaborative and contract research) and *commercialisation*

(TT). As such the lower ROIs in the former categories compared with the latter may reflect the greater challenges in developing robust and comparable proxies for impact for these categories. Other methods to estimate ROI including non-monetised impacts are discussed in sections 4.5 and 4.6.1 drawing on evidence and analysis in PACEC (2015a, 2015b) and Ulrichsen (2015).

Further it is important to note that different forms of KE can be highly interdependent, particularly over time, with more informal interactions helping to seed connections between academics and external partners that lead subsequently to more formal, funded KE activity. Overly focusing on comparing ROIs by category will fail to adequately capture the interdependencies between investments in different areas. Ultimately it also undervalues the benefits of HEIF as a flexible funding programme that enables HEIs to develop the necessary system of long-term KE-related capacity and capability based on their local needs and opportunities.

4.3 Assessment of the gross additional impacts of HEIF funding

Using these data, it is possible to estimate the gross additional impact of HEIF funding in generating KE income. The analysis, based on the expert judgements of senior KE professionals in English HEIs suggest that £1 of HEIF invested results in £6.1 of gross additional impact (here proxied by KE income) (Table 4). This is likely to represent a lower bound estimate of the total benefits to the economy and society not least due to the potentially large impacts that are very hard to capture, likely spillover- and multiplier-related benefits, and the long-term benefits arising from the positive behavioural and attitudinal changes it has had on academics towards engaging in KE (the latter established in the PACEC/CBR (2009) evaluation of HEIF). These wider “non-monetised” impacts have been explored in a 2015 study commissioned by HEFCE (PACEC, 2015).

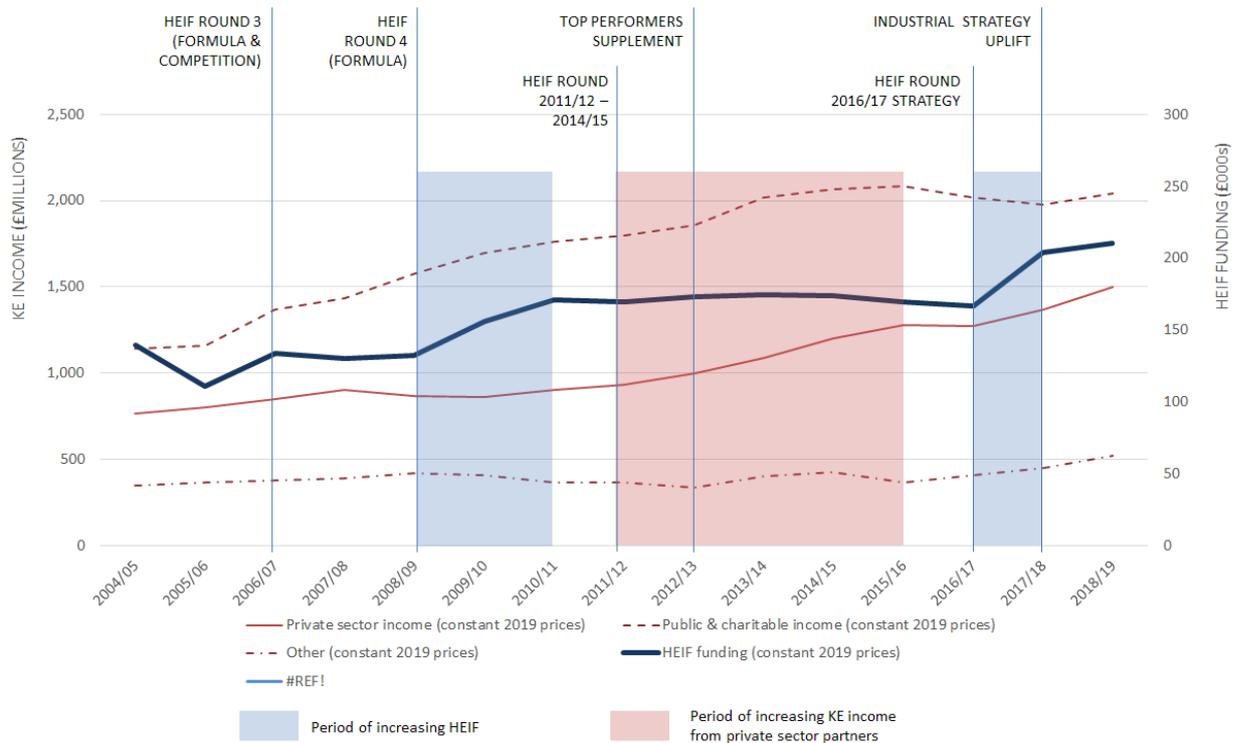
Table 4 *Estimates of the gross additionality of HEIF funding for English HEIs and by KEF cluster over the period 2015/16 – 2018/19*

	All HEIs	KEF Cluster						
		KEF_V	KEF_X	KEF_E	KEF_J	KEF_M	KEF_STEM	KEF_ARTS
Core KE income attributable to HEIF (£ millions)	4,542	2,209	1,002	709	165	17	403	37
HEIF funding (£ millions)	745	261	183	166	57	10	44	23
Ratio of core KE income attributable to HEIF to HEIF funding	6.1	8.5	5.5	4.3	2.9	1.7	9.1	1.6

The average ROI for HEIF for 2015/16-2018/19 has decreased slightly from the assessment based on expert judgements over the period 2005/06-2013/14 which estimated £6.4 of gross additional impacts was generated for every £1 of HEIF. Note that the current analysis covers a much shorter period than previous one due to data limitations. As such there are two important considerations to bear in mind when comparing these two analyses. First, we know from previous studies that there are long and complex time lags between KE investments and impacts (Hughes and Martin, 2012; Ulrichsen, 2015). A re-run of the 2015 analysis using the four year period 2010/11 – 2013/14 results in a return on investment to HEIF of 6.1, the same as for the current period being analysed. Second, and related to the first, the Government substantially increased HEIF funding in the middle of the current analysis period (from 2017/18 onwards). The effects of these increases will take time to be

realised and result in the expected increases in KE outcomes. In line with the nature of this type of funding, the full effects could take a number of years to materialise.

Figure 11 Trends in HEIF funding and KE income 2004/05 – 2018/19

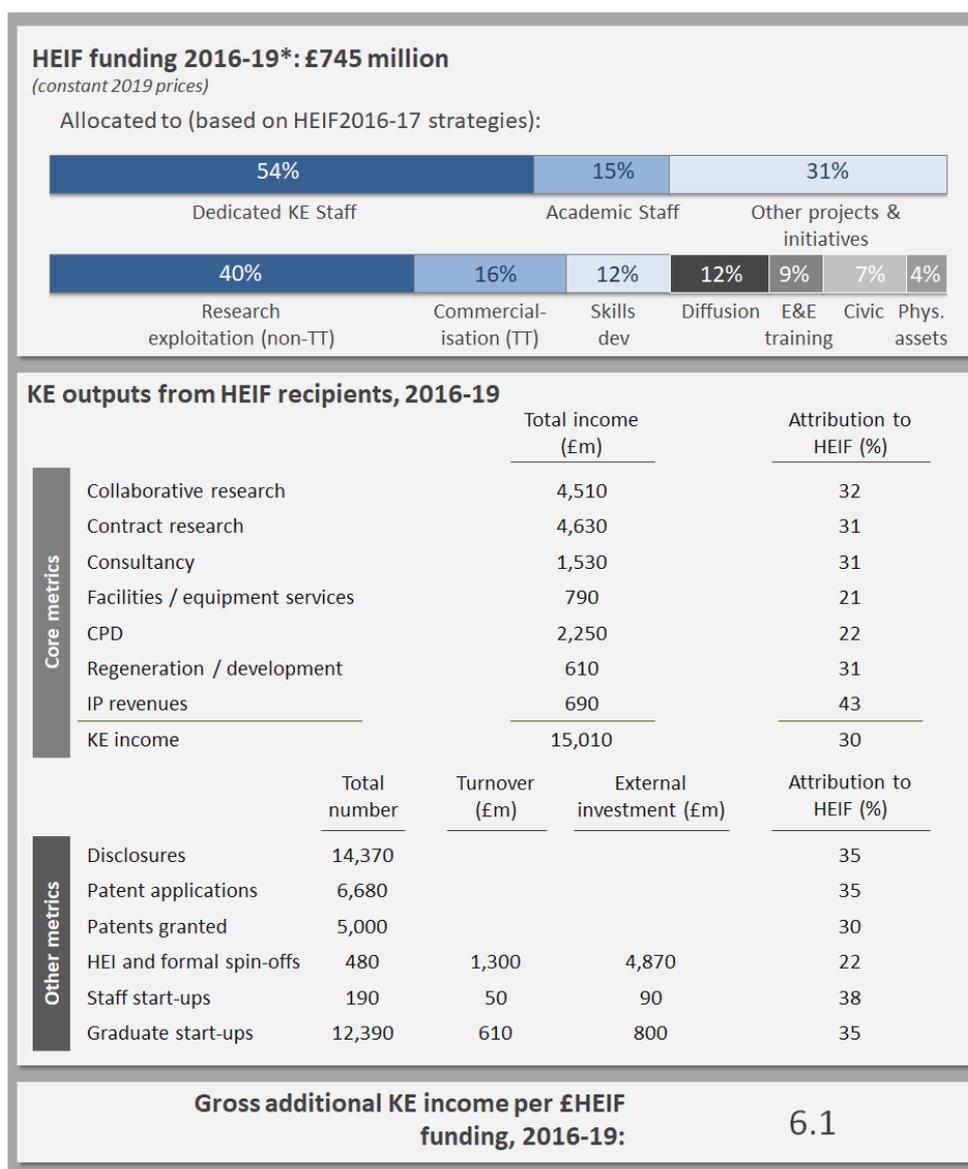


Sources: HEBCI surveys, HEFCE and Research England circulars

Figure 11 provides some tentative evidence to back up this proposition. It overlays the trends in KE income from private and public/third sector sources over the trends in HEIF funding. While just a correlation (i.e. not evidence of causation), the increases in KE income from the private sector began to take off a few years after the substantial increase in HEIF funding during round 4. This would be consistent with the view that there can be significant time lags between investing in KE and seeing tangible returns (Hughes and Martin, 2012). It is likely therefore that the tangible benefits from the significant increases in HEIF since 2017/18 will take time to materialise.

Figure 12 provides a summary of the key information and assessment of the gross additionality of HEIF.

Figure 12 Estimates of gross additionality of HEIF funding: summary

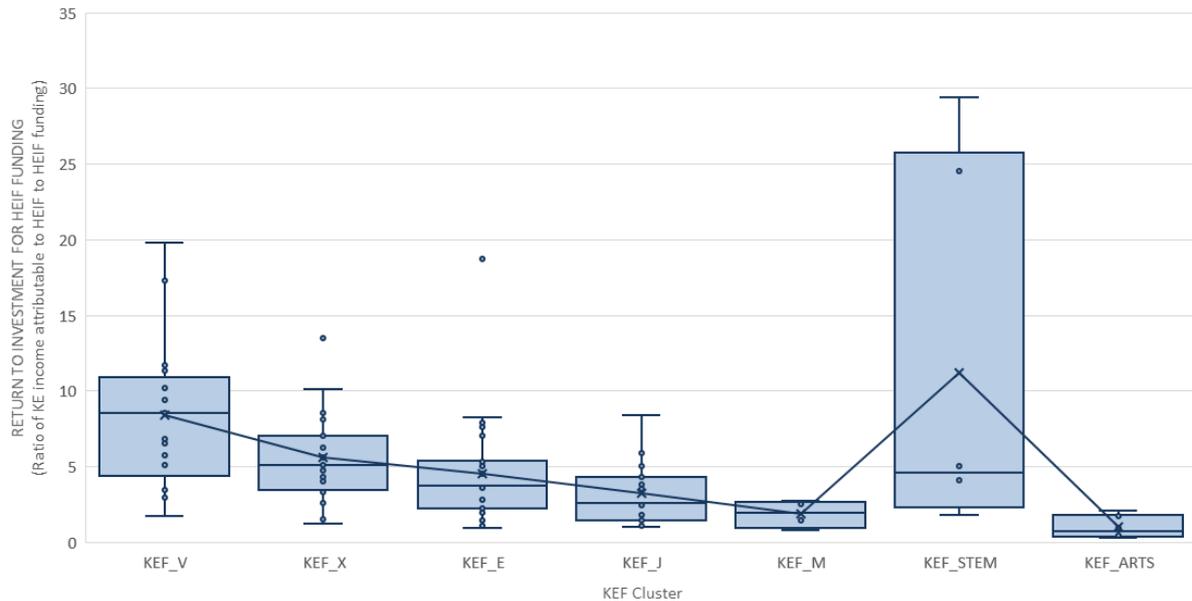


*Based on HEIs submitting HEIF 2016-17 institutional strategies. Excludes London Metropolitan University due to missing data on attribution of KE activity to HEIF funding. Excludes HEIs receiving HEIF funding in 2017/18 and 2018/19 but did not submit an institutional strategy in 2016/17.

4.4 Variations in gross additionality across KEF clusters and HEIs

Figure 13 presents the variation in the gross additionality for HEIF for individual HEIs by KEF cluster. It shows that the average for each cluster hides variation in HEIs with higher and lower values for gross additionality. I advise caution, however, in reading too much into individual level assessments of ROI as it is not possible to determine through the data available whether these differences are caused (a) by real differences in performance in the use of HEIF at a particular institution; or (b) due to differences in the way in which the HEI interpreted the question in the HEIF strategy around attributing KE outputs to HEIF.

Figure 13 Variations in the gross additionality of HEIF funding across and within KEF clusters, analysis over period 2015/16 – 2018/19



4.5 Estimates of the return on investment to HEIF realised through spinouts and start-ups

Previous assessments of the gross additional impact of HEIF have largely excluded the effects of spinouts and start-ups that form to commercialise intellectual property and knowledge developed within HEIs. To the extent they were included in the assessments it was through the IP income which included the proceeds to the HEI from the sale of its shares in the spinouts in which it took an equity stake.

In an evaluation of the ICURe programme by Ipsos Mori in 2018⁸, the evaluators argued that the benefits arising from the exploitation of technologies through spinout and start-up companies are very hard to capture. This is not least due to the fact that these companies are at a very early stage in their development journey with the economic benefits arising from the technologies being commercialised still very uncertain.

However, they argued that it would not be unreasonable to assume that **the amount the market is willing to invest in the company provides a useful and measurable proxy for the benefits that are likely to flow from commercialising the technology**. Crucially it assumes that the price the investor is willing to pay reflects the net present value of the future profits that the investor expects to earn (the economic rent) from their investment in the company over and above the amount they would expect to earn by placing their money in a risk free asset. It assumes that their valuation is able to account for the expected future technological and commercial risks. It also assumes that the technology is being commercialised for productive gains rather than as a defensive measure (a

⁸ Ipsos Mori, Barrett, G., Ulrichsen, T. (2018) *ICURe Evaluation: Final evaluation report (Report for Innovate UK)*. Ipsos Mori, London, UK.

reasonable assumption for IP being commercialised through a spinout rather than a license to an existing company).

Following the approach used by Ipsos Mori I therefore use the amount of external investment in spinouts and start-ups provided in the HEBCI dataset as an estimate of the current valuation of the market in the spinouts and start-ups emerging from HEIs.

Taking this approach for formal spinouts and staff start-ups, the analysis suggests that the gross additional impact of £1 of HEIF funding invested specifically in commercialisation (TT) rises from £6.8 to £15.4; while that invested specifically in enterprise education and entrepreneurship increases from £2.0 to £5.8. Overall, across HEIs' portfolios of HEIF investments, by including spinoffs and start-ups in the analysis increases the overall ROI for HEIF from £6.1 to £7.9 per £1 invested (+1.8).

Table 5 *Assessment of gross additional impacts from HEIF including external investment as a proxy for the benefits realised through spinouts/start-ups, 2015/16 – 2018/19*

KE infrastructure category	Gross additional impact of HEIF based core KE income	Gross additional impact of HEIF including effects of spinouts/start-ups
Research exploitation (non-TT)	8.8	8.9
Commercialisation (TT)	6.8	15.4
Skills & human capital development	4.3	4.4
Knowledge sharing & diffusion	3.1	3.2
Community & public engagement	1.3	1.3
Enterprise education & entrepreneurship	2.0	5.8
Exploiting physical assets	7.7	8.1
Total	6.1	7.9

Note that the economic value arising from student start-ups and the impact of HEIF in enabling this value to be realised was the subject of a 2015 evaluation by PACEC undertaken for HEFCE (2015b). The study showed that £1 of HEIF delivered £3.36 of 'business' value through student start-ups. When focusing specifically on the subset of student start-ups that had received some form of 'business support' from their university, the study estimated an ROI of £1.14. Note that the study does not link the value derived through student start-ups to the subset of HEIF funding that targeted this mechanisms, but rather to all HEIF funding received by an HEI. As such these estimates are 'additional' to the overall institution-level ROI estimates rather than being estimates of the ROI of student start-up focused HEIF investments (i.e. being KE infrastructure-specific as in Table 5). It is very hard, though, to compare the ROIs developed in this note with the PACEC estimates due to very different methodologies used.

4.5.1 A comment on net additionality

It is important that evaluations of the impact of policies attempt to move beyond gross additionality to assess the effects on substitution and displacement of private sector activity – i.e. net additionality.

This paper does not develop further insights into this issue, but argues that the nature of the KE services provided suggests that there is a strong presumption of high net additionality. In particular,

where KE activity is based on original research or know-how, training and expertise emerging from this research, it is unlikely that the private sector would be able to easily replicate the cumulative knowledge that underpinned the research in the first place. Some activities, such as regeneration and development-focused KE may be high in principle but in some areas there may be a dearth of private sector partners able or willing to deliver such services. Figure 14 shows that such activities are likely to constitute the bulk of KE activity (based on income). This follows arguments set out in Hughes et al. (2011) building on the evidence gathered in the PACEC/CBR (2009) evaluation of HEIF.

Figure 14 Degree of substitutability of KE activities

Type of KE	Share of total KE income (%)	Degree of substitutability
Contract research (original research)	31	Low
Collaborative research (original research)	30	Low
Courses (based on original research)	15	Low
Courses (training/other based on existing works)		High
Consultancy (deriving from original research)	10	Low
Consultancy (based on existing methods/knowledge)		High
Regeneration & development	4	Low/High
Facilities and equipment services (specialist)	5	Low
Facilities and equipment services (non-specialist)		High
IP/licensing/patents	5	Low/Mid
Spin-outs	n/a	Low/Mid
Events (based on research outputs)	n/a	Low
Events (based on existing knowledge)	n/a	High

Note: Shares of KE income based on the period 2015/16 – 2018/19

Source: adapted and updated from Hughes et al. (2011).

4.6 Updating the assessment of the gross additional impacts from HEIF arising from non-transactional KE activities

4.6.1 Estimating the monetary value of non-transactional KE activities

This section replicates the analysis in Ulrichsen (2015) that attempts to estimate the monetary value of non-transactional KE activities.

A common critique of using KE income as a proxy for economic impacts arising from KE activities is that the price fails to adequately capture the full impacts not least because there may be important impacts that are hard to monetise using income. To address this issue, back in 2015 the Higher Education Funding Council for England commissioned a study to evaluate the nature and scale of non-monetary impacts arising from HEIF funded KE activities (PACEC, 2015a). The findings from this study provide a starting point from which to capture some of the previously hard to monetise KE activity.

It is clear from the PACEC study that not all KE activities involve a monetary transaction, for example because of significant public good element to the service or due to other market failures present

meaning that public investment is required (e.g. inability of SMEs to access resources for early stage technology development or asymmetric information on how universities can contribute to SME innovation; or benefits to local economic development or local communities). KE income metrics will therefore fail to capture the impacts arising from such activity as no income changes hands.

However, the 2015 PACEC study provided useful evidence on the proportion of different types of KE activities involving transactions. This information can be used to estimate additional impacts arising from some further HEIF funded activities do not involve transactions. The method developed here is deliberately practical and represents a first attempt to explore these additional benefits given the available data. It is based on the idea of a 'shadow price'; the application of an estimated price to a good for which no market exists or where prices are too hard to calculate. In welfare economics, attempts are made to ensure prices reflect the full marginal social costs of production.

In our case, PACEC (2015a) suggested that while some interactions of a particular KE type (e.g. contract research or consultancy) involve a monetary transaction (and hence a price has been established for the transaction) others do not. This information can be used to estimate the economic impacts for KE activities of a similar kind for which no monetary transaction existed. It is not, however, possible from the information available, to estimate the impacts arising from KE activities for which no transactions typically exist (and are reported in databases such as HEBCI). This includes important areas such as public spaces and networks.

The practical method developed is as follows:

1. Match the estimates of the % of KE activities involving transactions from the PACEC (2015a) evaluation to the KE income streams in HEBCI
2. Assume that price paid for KE activities involving a transaction reflects the perceived value to the purchaser (as has been argued in Ulrichsen (2016))
3. Assume that the price of KE activity involving a transaction can be treated as a 'shadow price' for those not involving a transaction (i.e. it has the same perceived value whether it involves a transaction or not)
4. Apply this 'shadow price' to each KE income stream for the English HE sector as a whole to determine the 'missing' non-monetised element
5. Apply the estimates of HEIF attribution determined in the HEIF2016/17 strategies to estimate the additional KE income and relate this to the HEIF funding received.

The key findings from the above method are summarised in Table 6 and Table 7.

Table 6 Estimating the monetary value of non-transactional KE

HEBCI KE stream	PACEC equivalent	% involving transaction	Estimated non-monetised KE income component 2015/16 – 2018/19 (£millions)
Contract research	Contract research	0.87	692
Collaborative research	Collaborative research	0.87	673
CPD and CE	Training/CPD	0.5	2,250
Consultancy	Consultancy/research	0.87	229
Facilities and equipment related services	Premises	0.5	787
Regeneration and development programmes	Business advice/enterprise	0.5	615
IP (including sale of shares)	Licensing IP	0.87	103
KE income			5,348

Source: updated analysis from Ulrichsen (2015)

Table 7 Estimating the ratio of additional KE income arising from non-transactional KE to HEIF funding, 2015/16 – 2018/19

Estimated non-monetised KE income component, 2016-19 (£millions)	5,348
Attribution to HEIF (%)	30.3
Estimated non-monetised KE income component attributable to HEIF, 2016-19 (£millions)	1,618
HEIF funding 2016-19 (£millions)	745
Additional non-monetised KE income / HEIF funding 2016-19	2.2

Comparing the additional contribution from the above non-transactional KE activity with the amount of HEIF funding distributed over the period 2015/16 – 2018/19 suggests an additional return to investment of 2.2 (Table 7). This is in addition to the ROI of 6.1 estimated earlier in section 4.3.

Note that this method is an attempt, given limited data, to monetise KE activity for which limited information exists on its price. It attempts to correct for the fact that not all KE involves a transaction. However, it does not correct for the fact that the price paid for KE services may not fully reflect the benefits to the economy and society. A full ‘shadow price’ analysis would attempt to correct for this.

5 Summary

In summary, this note provides an update of the estimated gross additional impacts resulting from investments in KE through HEIF, covering the period 2015/16 – 2018/19. Table 8 brings together the various estimates of the return on investment to HEIF. Based on the core analysis, which uses KE income as a proxy for impacts, HEIF funding generated an average £6.1 for every £1 invested over the period 2016-19. A further £2.2 per £1 HEIF invested was estimated due to the activities that do not involve transactions but for which we have some insights into the value. Additionally, the analysis in this note presents a new method for estimating the ROI arising through the commercialisation of IP through spinouts and start-ups. This suggests a further £1.8 per £1 HEIF is generated overall through this mechanism alone.

Table 8 **Summary of key findings**

Return on investment due to:	Value
Core KE activities captured by KE income	6.1
Hard to monetised KE activities	+ 2.2
Formal spinouts / staff & graduate start-ups (new approach based on external investment as a proxy) [†]	+ 1.8

[†] PACEC (2015b), using a different methodology based on surveys of beneficiaries, estimate the additional impact of HEIF on graduate start-ups is 3.36 (when attributing to the broad contributions HEIs make to students)

Finally, when interpreting the various estimate of the return to investment of HEIF it is important to note a number of points. HEIF funding invests in the building of the capacity and capabilities of HEIs to engage successfully in KE and deliver increased socio-economic impacts through these more direct forms of engagement with external partners. As with other forms of investments that contribute to advancing R&D and early-stage innovation, and building the capabilities and infrastructure that enable innovation, HEIF will experience long and complex time lags between investing and fully realising the benefits on the economy and society. As such when analysing the overall impacts of HEIF, longer time periods help to internalise many of these lag effects. Recent increases in HEIF funding will likely take a number of years for the full effects to be realised and observed in the data.

It is also important to note that some of the ROI estimates presented in this note (e.g. in Table 4 and in the summary table above) relate to the overall effects of the portfolio of HEIF investments made by an HEI, while the estimates presented in Table 3 reflect the ROI for HEIF invested in specific forms of KE support infrastructure. For the latter, it is very important to recognise that the confidence intervals are likely to vary quite significantly by KE infrastructure category. This is because the key proxy measure for KE impacts used in this analysis is KE income based on the assumption that it reflects at least the minimum bound of value to the user. That said we know from PACEC (2015a) that there are some forms of engagement do not involve monetary transactions and that these are more likely in certain categories of KE such as *knowledge sharing and diffusion* and *community and public engagement*. As such the use of income as a proxy for impact in these categories will be less robust. This makes comparisons of ROIs across different types of KE support problematic. Lastly, overly focusing on ROI estimates by category risks undervaluing the benefits of HEIF as a flexible funding programme that enables HEIs to develop the necessary system of long-term KE-related capacity and capability based on their local needs and opportunities.

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