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Issues paper

This report is for information

This report assesses how third stream funding has secured economic and social benefits, by embedding a culture and capacity within higher education institutions (HEIs) that supports knowledge exchange. 'Third stream' refers to knowledge-based interactions between HEIs and organisations in the private, public and voluntary sectors, and wider society. The report finds there has been considerable progress over the first 10 years of this funding.

Evaluation of the effectiveness and role of HEFCE/OSI third stream funding

Executive Summary

Report to HEFCE by PACEC and the Centre for Business Research, University of Cambridge

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Contents

Executive Summary	1
X1 Aims and objectives	1
X2 Conceptual framework	1
X3 Rationale for third stream funding policies	2
X4 Empirical methodology	2
X5 Evolution and allocation of third stream funding	3
X6 The legitimacy of the third stream mission	4
X7 Building the capacity and capability to engage	6
X8 Achieving culture change in the HE sector	7
X9 Participating in knowledge exchange	10
X10 The scale and evolution of knowledge exchange outputs	10
X11 Impact on gross knowledge exchange outputs	11
X12 Wider impacts of HEFCE third stream funding on the HEI	17
X13 Impacts on the external partners	19
X14 Summary	20

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Executive Summary

X1 Aims and objectives

- X1.1 This report presents an assessment of the extent to which Higher Education Funding Council for England (HEFCE)/Department for Innovation, Universities and Skills (DIUS) third stream funding has secured direct and indirect economic benefits, by embedding a culture and capacity within higher education institutions (HEIs) that supports the transfer and exchange of knowledge between HEIs, business and the wider community. The term 'third stream' refers to interactions between HEIs and external organisations in the private, public and voluntary sectors, and wider society. It assumes that some knowledge or expertise flows between HEIs and users through these interactions.¹
- X1.2 The report aims to improve understanding of the benefits of third stream activity in the context of the Government's policy stance as set out in the Science and Innovation Investment Framework in response to the *Lambert Review of Business-University Collaboration*² (and, to a lesser extent, in the context of higher education's role in wider society described in, for example, the Dearing Report).

X2 Conceptual framework

- X2.1 The study has adopted an innovation systems framework for the purposes of analysis (reflecting the Government's policy agenda that has informed public funding for this activity). This framework has been increasingly emphasised in UK government thinking and is most apparent in the *Innovation Nation* White Paper (DIUS 2008) and in the Sainsbury Report *The Race to the Top* (Sainsbury 2007). Within the innovation system, third stream policy operates at the interface between the knowledge base, sources of new knowledge, networks and collaborative arrangements and firms' ability to absorb knowledge, technology and other expertise. It may be seen as an attempt to address institutional failure reflected in the inability of the innovation system to adapt to changed patterns of behaviour and rules or norms affecting inter-agent transactions which arise from broad underlying technological and other changes in the innovation system.
- X2.2 Seen from this perspective, third stream policies are designed to develop linkages and promote networking and other activities to allow the co-evolution of activities and processes in HEIs and external organisations in the public, private and voluntary sectors, and in wider society. Their impact therefore depends on the extent to which the particular policy instruments used affect the pattern and direction of interaction, and on the underlying cultural norms which govern the incentives for individuals to

¹ The term 'third stream' is used throughout the report, reflecting the use of language in HEFCE's original tender document. Terms such as 'knowledge transfer/exchange', 'enterprise', 'outreach' or 'engagement' are more commonly used in the higher education (HE) sector and in Government.

² HM Treasury (2003) www.hm-treasury.gov.uk/lambert_review_business_university_collab.htm

engage in knowledge exchange (KE) and related activities on both the supply and demand side of the economy and to integrate HEIs into the innovation process.

X3 Rationale for third stream funding policies

X3.1 The innovation systems framework suggests a number of reasons why third stream policies are necessary in order for the HE sector to achieve greater impacts on the economy and society:

- cultural inhibitions and lock-in problems arising from traditional HEI norms and practices, which may impede or hamper the process of knowledge exchange
- under-investment by HEIs in their capacity and capability to engage in knowledge exchange, because of:
 - inability of the knowledge base to sustain in-house offices
 - difficulties in securing an acceptable share of any benefits
 - cultural constraints
- limits on the ability of the innovation system to adapt to technological and other changes in terms of:
 - the underlying cultural norms which govern the incentives for individuals (on the supply and demand side) to engage in knowledge exchange
 - changing patterns of behaviour and the rules or norms of HEIs and external organisations affecting their interaction (openness versus secrecy)
 - the increasing role of HEIs in the commercialisation of scientific advances
- limited linkages, networking and collaboration by HEIs and other economic and societal agents, reducing the potential contribution of HEIs to the innovation process
- limited financial benefits from engagement with society and the wider community, leading to potentially low levels of knowledge diffusion with these groups.

X4 Empirical methodology

X4.1 The evaluation was carried out during 2008. The programme of empirical research was set within a traditional evaluation framework analysing the relevant inputs, activities, outputs and the resulting impacts. In addition, cost-benefit balance sheets were produced which compared the inputs to the outputs of knowledge exchange where quantifiably possible. A discussion of other qualitative outputs is included in this analysis.

X4.2 Both secondary and primary data were used in the analysis. Secondary data sources included the Higher Education Business and Community Interaction (HEBCI) surveys, Higher Education Statistics Agency and other HEFCE sources such as HEI funding bids and annual monitoring reports. A primary database was also assembled from case study research of 30 HEIs; survey responses from 1,157 academics and from 373 external organisations engaged in third stream activities with HEIs; and from

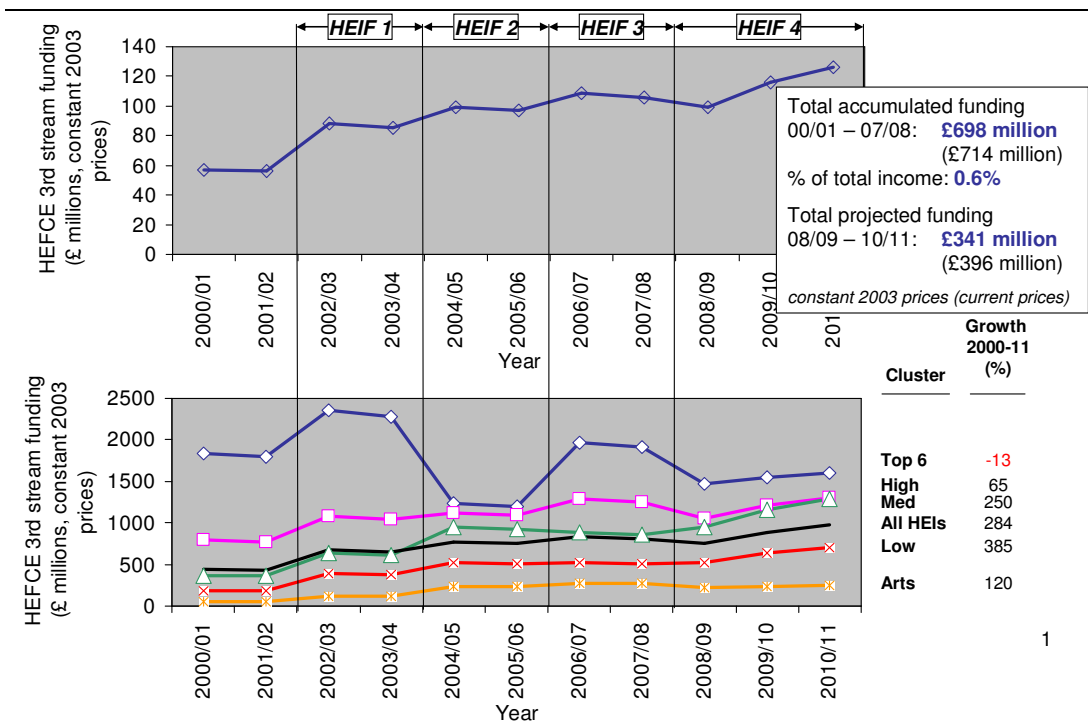
interviews with a range of stakeholders, including central government departments and the Regional Development Agencies (RDAs).

X4.3 The case studies were selected on the basis of a cluster analysis. Six key clusters were identified, largely reflecting the scale of HEIs' research activity: the top six HEIs, high research HEIs, medium research HEIs, low research HEIs, arts HEIs, plus all HEIs.

X5 Evolution and allocation of third stream funding

Total committed third stream funding between 2000/01 and 2010/11 amounts to £1 billion (at 2003 prices) and has increased for all HEI clusters except the top 6, where it has declined by 13% (Figure X1)

Figure X1 Evolution of HEFCE third stream funding 2000/01 to 2010/11 (£ millions, constant 2003 prices)



Source: HEFCE, PACEC/CBR analysis

Dedicated knowledge transfer staff have accounted for the largest proportion of Higher Education Innovation Fund (HEIF) spending, amounting to 31% of funding in the period 2002/03-2003/04 and rising to a planned 52.3% in the latest HEIF 4 funding round

X5.2 The most important allocation of funds has gone to activities concerned with dedicated knowledge exchange staff; the promotion of knowledge exchange units, institutes and research centres; and initiatives and projects connected with knowledge exchange generally. Relatively small elements of funding have been associated with investments in spin-outs and proof of concept (PoC) and seed funding. The most significant difference between the first and fourth HEIF rounds is

the substantial increase in the proportion of funding going to support dedicated knowledge exchange staff, which is 52.3% in HEIF 4 compared with 31.1% in HEIF 1. Support for staff engagement has risen from 1.5% to 14.9%. Seed and PoC funding has also risen from 1.8% to 5.4%, and marketing from 1.1% to 4.3%. The top six research intensive HEIs and the arts cluster spend the most proportionately on dedicated knowledge exchange staff, while the low research intensity cluster spend the least proportionately.

X6 The legitimacy of the third stream mission

There is now strong support from senior HEI management for knowledge exchange activities, and knowledge exchange is now a core strategic aim across all HEIs

X6.1 Successful mutually beneficial engagement with external organisations has required strategic and organisational shifts on the part of HEIs and their partners, and a commitment by senior HEI managers in support of the third stream mission. As a consequence, and as the importance of knowledge exchange activities has increased, HEIs have had to recast their strategic aims and adapt their organisational and institutional structures to acquire new capabilities and capacity to complement those required to fulfil their traditional research and teaching functions.

X6.2 There is now strong support for the third stream mission by senior management across all HEIs, although the emphasis given to the balance between teaching, research and third stream activities inevitably differs across HEIs. These differences are reflected in a diversity of mission statements and strategic aims across the HE sector. Notwithstanding this diversity, the mission statements and visions of most HEIs, across all types – from the top research HEIs to regional HEIs, old HEIs and new ones – now include explicit references to the third stream as an important role for the institution. Such positive change in culture at the senior level of HEIs is an important development for the innovation system as a whole. This is because, while not a sufficient condition for increasing the benefits that HEIs can deliver to the economy and society, it is certainly a necessary development.

There is widespread recognition of the synergies between knowledge exchange activities and teaching and research, with relatively little displacement

X6.3 The analysis of HEIF 4 strategies and the case studies revealed widespread recognition of the synergies between knowledge exchange activities and activities related to teaching and research. The case studies pointed to clear opportunities for creating virtuous feedback linkages between teaching, research and knowledge exchange activities, with each strand supporting and reinforcing the other. Almost all the senior managers interviewed believed that knowledge exchange activities complement the mainstream missions of teaching and research, with little variation across different types of HEIs. There was evidence of some displacement of teaching or research, largely owing to time constraints, and third stream activities became relatively more burdensome when pressures to fulfil Research Assessment Exercise requirements intensified.

Income generation is becoming increasingly important as a long-term goal for knowledge exchange activities

X6.4 Income generation is becoming increasingly important, partly because of the way in which HEIF funding is now being allocated (via a formula which is partially income driven), but also as a consequence of wider financial pressures. For some HEIs the role of HEIF (and other funding) is to pump-prime third stream activities that promise self-sustainability. Such activities must therefore generate some form of income to at least cover their costs.

Government policy, a dedicated funding stream, leadership and financial pressures have been the main drivers of the increasing importance of the third stream mission

X6.5 The emergence of knowledge exchange as a core strategic objective for HEIs alongside teaching and research has been driven by a number of factors:

- Government policy has raised awareness among senior management and staff that the pursuit of knowledge exchange goals alongside teaching and research is a recognised and acceptable goal for HEIs.
- The presence of a dedicated third stream funding programme from HEFCE, combined with a positive and pro-active campaign at government level, has also raised awareness of the legitimacy of such activities, backed by financial resources.
- The leadership provided by a dynamic and supportive vice-chancellor is seen as very important in driving forward the third stream agenda.
- Growing financial constraints facing HEIs mean that institutions, especially those with a large science and engineering research base, are increasingly seeing income from knowledge exchange as a means of greater financial security and a way of decreasing their reliance on public funding.

HEFCE third stream funding has had an impact on the development of knowledge exchange strategies at departmental level

X6.6 The increased profile of the third stream mission and the development of improved knowledge exchange strategies have inevitably filtered down to, and impacted on, individual departments and academic disciplines. Of the academics surveyed, 45% perceived an impact on the development of KE strategies within their departments as a consequence of HEIF funding. In addition, 49% of academics believed that HEIF funding has led to their department developing a strategy for increasing non-traditional sources of funding.

Small and medium-sized enterprises (SMEs) are the most frequent target for third stream activity, but for top six and high research HEIs large corporations and the public sector are important

X6.7 SMEs are the most frequent type of external organisation explicitly targeted in HEI strategies, and are a strong focus for knowledge exchange by HEIs in the medium/low research and arts clusters. Large corporations are of obvious significance for the top six and high and medium research clusters, but much less so for the low research and arts clusters.

X7 Building the capacity and capability to engage

Knowledge exchange offices (KEOs) are becoming more professional and pro-active in generating opportunities with external organisations, but most engagements are still initiated without the involvement of the KEO

X7.1 The extent to which knowledge exchange offices seek out third stream opportunities for academics to pursue varies substantially within the HE sector. At one end of the spectrum is the view that the identification of opportunities should remain the responsibility of academics and that the role of the KEO should be as a facilitator once the opportunity has been identified. Most HEIs adopt this largely reactive strategy towards generating third stream opportunities. However, there is evidence that KEOs are becoming increasingly professional and more pro-active in their interactions with external organisations. This is very much the case in the top six and high research HEIs. In particular, long-term strategic relationships are being developed more actively, along with attempts to map business needs more closely to capabilities within the HEI. High-calibre KE staff who can understand not only the requirements of the strategic partner but also how the academic capabilities within the HEI can help the organisation are increasingly recognised as the lynchpin for developing successful relationships.

X7.2 KEOs are the least frequent mechanism for initiating interactions between academics and external organisations, with only 13% of academics choosing this route. External organisations and individual academics engaging directly is the most frequent mechanism (74%) for initiating third stream activity.

Knowledge exchange offices face a number of constraints on their growth, namely their ability to attract suitably qualified staff, shortage of finance and negative attitudes of academics

X7.3 KEOs face a number of key constraints to their further development. A very severe constraint facing HEIs is the ability to attract KE staff with suitable qualifications and capabilities, given the salary levels on offer. In some HEIs, there was a perceived lack of capability in dealing with the legal side of the KE engagement process. Other key constraints include adverse attitudes towards knowledge exchange by some academics, the inability of KEOs to 'stand up against the research forces', and restrictions on KEO growth to avoid overlap with other KE activities within the HEI.

Considerable scope remains for raising the awareness of the benefits that KEOs can bring to academics and external organisations engaging in knowledge exchange

X7.4 Despite the substantial investments in KEOs and the subsequent improvements made in capability and capacity building, 45% of the academics surveyed had had no contact with KEOs over the past three years, despite most being aware of their services. However, this figure decreased to a much lower level for science subjects (28%) and those conducting user-basic research (32%). From the perspective of external organisations engaged with HEIs, only 37% were aware of the HEI's knowledge exchange office. Companies which spent more on their interactions with HEIs were more likely to be aware of the KEO, as were those located in the Midlands.

Without HEFCE third stream funding many of the knowledge exchange facilities and infrastructure would not exist or would be of a smaller scale and quality

X7.5 HEFCE third stream funding has helped to provide the necessary investment and stimulus to develop the structures – infrastructural and organisational – to better engage in knowledge exchange activities. It has helped to address this clear failure in the innovation system in the following ways:

- It has allowed HEIs to grow their capacity and capability over a much shorter period of time than would otherwise have been the case.
- It has provided the direct resource that has funded, and continues to fund, much of the knowledge exchange infrastructure. Many smaller HEIs would not have been able to fund the development of their capacity and capability had HEIF funding not existed. Even many of the larger, well-established HEIs rely on HEIF to partly or wholly fund particular KE units, such as regional liaison offices and continuing professional development (CPD) units.
- It has helped HEIs to professionalise the process, for example through increased training and hiring high-calibre staff with more relevant industrial and academic experience.
- It has impacted on the breadth of coverage of knowledge exchange capacity and capabilities.
- It has allowed HEIs to target their KE support services internally to a greater number of departments and externally to a greater number of sectors than would otherwise have been the case.
- It has been instrumental in creating an integrated approach to knowledge exchange.

X8 Achieving culture change in the HE sector

X8.1 Implementing strategic change in a large organisation such as an HEI can require more than simply announcing new strategic initiatives, modifying incentive structures and committing resources to develop infrastructure and supporting organisational structures. The persistence of existing routines, norms and values can impede the new strategic direction from being achieved. To fulfil the third stream role demanded of HEIs therefore requires a cultural shift to one that embraces not only teaching and research but also their transformation into benefits for the economy and society. A strong, positive knowledge exchange culture at the senior management level of HEIs is a critical necessity, but not a sufficient condition for cultural change within the rest of the institution. The actions of senior management will, in turn, influence how those in charge of faculties organise their departments and the types of activities they demand from their staff. In addition, all staff – from senior management to academic – will be impacted by external forces that shape their value judgements and, by implication, culture.

X8.2 To identify cultural shift, the study used seven indicators: motivation for knowledge exchange, responses on the role of HEIs in the economy, perceptions of how academics view knowledge exchange, the role of knowledge exchange vis-à-vis teaching and research, criteria for promotion and assessment, incentives for knowledge exchange, and awareness of the value of knowledge exchange.

Overall, there has been a modest change in culture among academics towards a more positive attitude to engaging in third stream activities. Neither the process of cultural change nor its embeddedness is complete, although significant progress has been made

- X8.3 Academic support for engaging in KE activities was associated more with the perceived benefits to the academics' research programmes than to their commitment to the third stream mission. Those who engaged in knowledge exchange activities were not motivated by the financial rewards they generate, but rather by the benefits that engagement delivers either to what they perceived as their core activities, or to the wider strategic mission of the HEI (e.g. 47% of academics were motivated by furthering their HEI's outreach mission). This has potentially important implications for the design of incentive structures where academics are engaged in research, teaching and third mission activities.
- X8.4 There was wide acceptance among academics that:
- higher education has a key role to play in the competitiveness of businesses in Britain
 - entrepreneurship is of vital importance to the British economy
 - HEIs have given a much greater priority to involvement with businesses and the local community over the past three years, a view which has become more widespread since an earlier survey in 1995.
- X8.5 The cultural attitude towards knowledge exchange activities has become more positive over the period 2001-08, with 76% of academics now perceiving a positive culture compared with 61% in 2001. Academics increasingly disagree with the statement that academia should focus on basic research and should not be concerned with its actual or potential application. However, there was much less consensus on whether HEIs have gone too far over the past few years in attempting to meet the needs of external organisations, to the detriment of their teaching and research roles.
- X8.6 The criteria by which academics are promoted and assessed provided a good indicator of the culture that HEIs *would like* to develop in relation to different types of activities. While the importance of the more traditional promotion criteria of research and teaching have remained approximately constant over the period 2001-08, the criteria relating to engaging with external organisations have increased in importance.
- X8.7 There is some evidence that HEIs are beginning to alter their recruitment criteria, informally or formally, and that they are increasingly recruiting candidates with greater credentials from the private, public and voluntary sectors. However, there still appears to be limited movement of labour between external organisations and academia, particularly in the higher research intensive HEIs, and an increasing number of academics perceive that taking non-academic sabbaticals damages their careers.
- X8.8 Academics appear to be increasingly aware of the value and benefits that engagement with external organisations can bring to their careers. There is also a growing recognition of the need to protect and commercialise their intellectual

property (IP) as well as a better understanding of the issues surrounding commercialisation. At the same time, there is also a growing feeling that academic research and expertise should be made more accessible to the wider public. These attitudinal shifts have combined to help foster a more open-minded approach to participating in knowledge exchange. However, one-third of academics did not feel knowledgeable about the issues involved in commercialising their research, but would be interested in its commercial application. Only a minority of respondents were not interested in the commercialisation of their research or in getting directly involved with its commercialisation.

HEFCE third stream funding has played an important role in bringing about positive cultural and attitudinal change within HEIs towards knowledge exchange activities

X8.9 The HEFCE third stream funding programmes have had a positive impact on the culture of academics towards engaging with knowledge exchange, one of the central rationales for intervention. The sustained, visible government campaign surrounding these funding programmes (particularly HEIF) over many years – and the resources they have provided – has helped to demonstrate the value and legitimacy of knowledge exchange as a core activity to academics. In turn, this has helped to bring about positive shifts in the culture within HEIs towards third stream engagement.

There is a close alignment of academia and non-academic organisations on the importance of HEIs to the economy and society

X8.10 Alignment of attitudes between knowledge providers and consumers on the importance of HEIs to the economy and society, and of knowledge exchange in relation to teaching and research, is likely to improve the effectiveness of the KE process and the benefits that transpire. The study found very similar attitudes towards:

- the role of HEIs in the economy and society
- the key role of HEIs in the competitiveness of British businesses
- academic freedom being of fundamental importance to society
- entrepreneurship being vital to the British economy.

Beliefs differed, unsurprisingly, on the focus of HEIs. External organisations which interacted with HEIs were less likely to believe that academia should focus on basic research and not be concerned with its actual or potential application.

Supply and demand-side barriers constrain engagement between HEIs and external organisations

X8.11 Two-thirds of academics believed that the lack of time to fulfil their HEI commitments is a key supply-side barrier to increasing engagement. In addition, 28% of academics believed that there are insufficient rewards resulting from the interactions. Cultural resistance towards engaging in knowledge exchange ranked last of the constraints perceived by academics to increasing engagement.

X8.12 While HEIF funding is primarily aimed at correcting the supply-side problems that exist within the HE sector, a number of demand-side issues remain to be addressed. In particular, 28% of academics believed that the inability of external organisations to meet the full costs of engagements constrained their interactions. This constraint is particularly acute for micro-companies.

X9 Participating in knowledge exchange

High levels of academic participation in knowledge exchange

X9.1 Approximately half of academics engaged in knowledge exchange activities over the past three years through the 'core' modes of interaction (e.g. contract research, consultancy, prototyping and testing services, CPD provision etc). The participation rate increases to 75% when this definition is broadened to include other forms of interactions with external organisations, such as attending meetings and conferences with external organisation participation, membership of advisory boards and providing informal advice. Results from the HEBCI survey also suggest that HEIs perceive a positive change in the degree of academics' participation in knowledge exchange activities in the private, public and social, community and cultural sectors. The largest change has come in engagements with the public sector, with HEIs in the medium and low research intensity clusters exhibiting the largest percentage point changes over the period 2004 to 2007.

X9.2 CPD, contract and joint research, and consultancy are the most frequent 'core' modes of interaction with external organisations. Attending conferences with external organisation participation and providing informal advice are the most frequent 'other' modes of interaction.

X9.3 Almost one-fifth of academics have formed or run a consultancy via their research, while 13% have taken out a patent. However, very few have licensed their research outputs or formed spin-off companies over the past three years. Licensing research outputs to British-owned companies, forming or running a consultancy and forming a spin-off company in the local area are the most common modes of commercialisation that academics would like to undertake compared with the existing level.

X10 The scale and evolution of knowledge exchange outputs

Knowledge exchange activities of HEIs generated £1.94 billion in income in 2007, growing by approximately 12% per annum over the period 2001-07

X10.1 The overall scale of knowledge exchange income grew from approximately £0.98 billion in 2001 to £1.94 billion in 2007. Contract research made the largest contribution to this income in 2007, with income from collaborative research and courses generating 23% and 19% of total knowledge exchange income respectively.

X10.2 Revenues from intellectual property constitute a very small proportion of the total income derived from knowledge exchange. However, the current revenues generated

by HEIs' intellectual property portfolio will greatly underestimate the net present value of these agreements. This is because much of the value from licence deals may take many years to be realised.

X10.3 The composition of knowledge exchange income is highly dependent on the cluster. Research intensive HEIs focus heavily on contract and collaborative research, while those with a more teaching focus generate large proportions of their income through courses.

X10.4 There is also a correlation between the research intensity of HEIs and the share of regeneration and development income in total knowledge exchange. Those in the medium and low research intensive and arts clusters secure a much greater share of their knowledge exchange income through this type of activity.

Income from non-commercial organisations such as the public sector and charities constitutes the largest proportion of knowledge exchange income, with income from SMEs generating the least income for HEIs

X10.5 Income from non-commercial organisations (such as public sector bodies, not-for-profit organisations and charities) constituted 35% of total knowledge exchange income in 2007, while income from non-SMEs (commercial organisations that are not classified as SMEs) generated 21% of the total. The low share of SME income in total knowledge exchange income (6% in 2007) hides the extent of engagement with this type of company. Of all engagements, 28% were with SMEs; this figure increased dramatically to almost half of all engagements for the medium and low research intensity and arts clusters.

On average, more people attend free events than chargeable events held by HEIs, with the number of attendees for most types of events growing over the period 2004-07

X10.6 The societal outputs of knowledge exchange engagements are much harder to quantify than the more commercial engagements undertaken by HEIs. Social, community and cultural events represent one key area of the societal impact of HEIs. Overall, the number of attendees at most types of events, both free and chargeable, grew over the period 2004-07. Only the number of attendees at chargeable museum education events declined. Exhibitions were the most popular free event, while performance arts drew the largest number of people at chargeable events. HEIs in the top six research intensive cluster attracted the most attendees per HEI to their events, both free and chargeable. They also attracted more people per staff day required to host their free events, followed closely by HEIs in the arts cluster.

X11 Impact on gross knowledge exchange outputs

X11.1 The gross impact is the impact of HEFCE third stream funding on knowledge exchange outputs without taking into account the displacement of third stream activities that would otherwise have been undertaken outside the HE sector (e.g. consultancy by private consultancies, contract research by large corporate research labs, testing by government research establishments etc).

X11.2 Measuring the impact of HEFCE third stream funding on gross knowledge exchange outputs is a very difficult exercise, with the problems exacerbated by a lack of a long time series of data. This prevents the traditional 'control group' approach that either compares periods where HEFCE third stream funding did not exist with periods after its introduction, or compares HEIs that never received any support with those that did receive support. A multi-pronged approach was used consisting of the following five methods:

- 1 comparison of a 'weak' policy period with a 'strong' policy period, with the former representing the initial years of the funding programme where HEFCE third stream funding was relatively low and fragmented, and the latter representing the period where the many funding programmes were consolidated and the levels of funding increased
- 2 comparison of HEIs that initially received third stream funding with those that did not
- 3 comparison of HEIs that received large amounts of third stream funding with those that received relatively less funding over the period
- 4 estimation of the marginal impact, using multivariate econometric modelling
- 5 estimation of the average impact, using subjective-based estimates of gross additionality.

X11.3 Given the uncertainty surrounding any one method, the report draws its conclusions based on the complement of evidence from each of the five approaches.

Knowledge exchange income grew faster in the strong policy period compared with the weak policy period, for HEIs that initially received HEFCE third stream funding compared with those that did not, and increased more for those that received relatively more funding over the period

X11.4 The key results from the analyses are as follows:

- Total knowledge exchange income, excluding contract research income, grew more rapidly in the strong policy period (14% per annum) than during the weak period (3% per annum), although there was considerable variation between income streams. In addition, all clusters except the top six research HEIs grew faster in the strong policy period compared with the weak period.
- HEIs that received HEFCE third stream funding in the initial period grew their income by approximately £9.8 million per HEI between 2001 and 2007, compared with £4.6 million for those that did not receive initial support.
- HEIs that received larger amounts of HEFCE third stream funding over the period 2001-07 increased their knowledge exchange income to a much greater degree across *all* income streams than those that received less.

X11.5 The funding enabled HEIs to extend their ability to build their capability and capacity to interact with external organisations. It also allowed HEIs to encourage and enable their academics to engage (e.g. through providing funds to buy out academic time, thus relieving the high time constraints facing academics, or providing proof of concept funding). The funding has helped to bring about a more positive culture towards knowledge exchange engagement. There is therefore a strong presumption that HEFCE third stream funding has had a positive impact on the overall growth of knowledge exchange income.

X11.6 There are also likely to be large time lags between investing in infrastructure and capacity and capability building, and realising increased knowledge exchange income. Those HEIs that received funding initially are likely to have developed their infrastructure to a greater extent and learnt more from their experiences than those that received funding in the later rounds.

HEFCE third stream funding has changed the nature of activities, increased the scale of activities and speeded up the introduction and/or expansion of knowledge exchange activities

X11.7 HEFCE third stream funding has impacted on the nature of the activities undertaken by HEIs. For example, it has enabled HEIs to undertake many collaborative initiatives that otherwise would not have taken place, and has allowed them to pursue the exploitation of knowledge, expertise and programmes that previously would have received a much lower priority within their institution (e.g. research that may have high long-term value but very poor short-term returns). Knowledge exchange engagement would likely have been much more geared towards short-term income generation, potentially limiting the types of benefits that HEIs can deliver to the economy, and particularly to society.

X11.8 The scale of knowledge exchange activity in the HE sector has also increased as a result of HEFCE third stream funding, according to the HEIs studied. The funding has enabled the necessary structures to be put in place. It has also stimulated changes to the incentives for engaging with external organisations. These incentives, particularly those relating to promotions and those that relieve the time pressures facing academics, have been very important in helping to increase participation in knowledge exchange activities.

X11.9 Overall, the research suggests that there would have been much less development in knowledge exchange engagement in HEIs without a history of interacting with external organisations, particularly in HEIs with a primarily teaching mission. HEFCE third stream funding has been crucial for providing the initial infrastructure and organisational structures, along with the stimulus for strategic change that would not have occurred to the same extent, as rapidly, or covering the same scope.

HEFCE third stream funding has had a statistically significant marginal impact on knowledge exchange income

X11.10 To estimate the marginal impact – i.e. the effect of an extra £1 of HEFCE funding – a regression equation has been estimated. This relates knowledge exchange income to HEFCE third stream funding, taking into account other factors that might be expected to impact on knowledge exchange income. This objective approach can only control for a limited number of factors owing to data limitations.

X11.11 There is a statistically significant positive impact of third stream funding over the period 2001-07 on knowledge exchange income in 2007, when a variety of other variables that could also impact on total income are taken into account. The

regression analysis suggested that a 10% increase in HEFCE third stream funding in the period would have yielded a 1.5% increase in knowledge exchange income.

- X11.12 The regression equation also shows that the size of the HEI in terms of the number of academic staff (full-time equivalents) and the amount of research income received by the HEI are also important for explaining knowledge exchange income. This may be a reflection of the economies of scale in the provision of many KE services, positive feedback on participation by having a large number of staff engaging, and the synergies between research and knowledge exchange activities.
- X11.13 Access to on-campus incubators has had a significant positive impact on knowledge exchange income, while the impact of access to seed-corn funding and science parks is insignificant. Surprisingly, access to venture capital is negatively related to knowledge exchange income.
- X11.14 A number of external factors have impacted on the current level of knowledge exchange income. A high share of employment in SMEs in the local area of the HEI is linked with lower knowledge exchange income, while the converse is true for HEIs located in areas with a high share of employment in high-technology sectors. Surprisingly, on average, HEIs in areas with high growth in gross value added have experienced lower knowledge exchange income.

HEIs believe that between 28% and 41% of knowledge exchange income can be attributed to HEFCE third stream funding

- X11.15 Evidence based on a survey of HEIs conducted by Quotec in 2006 suggested that between 28% and 41% of knowledge exchange income can be attributable to HEFCE third stream funding, either directly or indirectly. Our more limited sample based on interviews with senior management of HEIs during the case study research programme agreed with this, albeit at the upper end of the range.

The injection of £592 million by HEFCE through its third stream funding programmes over the period 2001-07 has generated between £2.9 billion and £4.2 billion in gross additional knowledge exchange income over the same period

- X11.16 Gross knowledge exchange income was £10.3 billion over the period 2001-07 (in 2003 prices). Assuming the lower end of the additionality estimates of 28%, an injection of £592 million by HEFCE through its third stream funding programmes over the period 2001-07 has generated £2.9 billion in gross additional knowledge exchange income over this period, either directly or indirectly. This equates to a gross additional impact factor of 4.9. Assuming the upper end of the additionality estimates of 41%, the same injection suggests that £4.2 billion in gross additional knowledge exchange income over the period can be attributed, either directly or indirectly, to HEFCE third stream funding programmes. This equates to a gross additional impact factor of 7.1.

X11.17 However, this calculation may underestimate the true factor as it only includes those activities that generate income and are reported in the HEBCI surveys. A variety of non-quantifiable outputs could not be included, such as:

- social impacts that could not be monetised
- non-monetary benefits of otherwise income-generating activities, such as their educational and social value, and indirect effects of the engagements
- social benefits that are not captured by price paid by external organisations for the KE service
- lack of reliable data on outputs such as the value of spin-out companies
- indirect effects of engagements on external organisations.

The effect of these non-quantifiable outputs would be to increase the additionality of HEFCE third stream funding.

X11.18 In summary, each of the above approaches provides convincing evidence of a positive impact of HEFCE third stream funding on knowledge exchange income.

HEFCE third stream funding has resulted in a wide variety of outputs, both economic and social

X11.19 The complexity and diversity of the impacts of third stream funding preclude both a traditional cost-benefit analysis and a cost-effectiveness analysis. For this reason the approach in addressing the issue of value for money has been to establish a cost 'benefit' balance sheet which relates the third stream funding inputs to knowledge exchange outputs. The cost-benefit balance sheet does not include the indirect impacts that third stream funding may have enabled (see X11.7). A balance sheet for the overall sector is shown in Table X1, while separate balance sheets for each cluster are contained within Appendix C of the report.

Table X1 Cost 'benefit' balance sheet for the English HE sector

Inputs			Quantifiable outputs		
			Type	Period	Total output
HEFCE third stream funding (£m)	University Challenge Seed Fund	42	Collaborative research (£m)	2001-07	2,768
	Science Enterprise Challenge	40	Contract research (£m)	2001-07	3,200
	HE Reach Out to Business Comm	96	Consultancy (£m)	2001-07	1,080
	HEIF	300	Facilities and equipment (£m)	2001-07	354
	HE Active Community Fund	27	Courses (£m)	2001-07	1,688
	Knowledge Transfer Capability Fund	8	Regeneration/development (£m)	2001-07	960
	Centre for Knowledge Exchange	36	IP revenues (£m)	2001-07	228
	Other	43			
Total HEFCE third stream funding 2001-07 (£m)		592	Total income (£m)		10,279
Non-HEIF funding		n/k			
Allocation of expenditure to inputs (% HEIF 4 expenditure)			Non-income outputs		
Allocation of expenditure to inputs (% HEIF 4 expenditure)	Dedicated KE staff	52.3	Number of course days	2004-07	13,586,205
	Support for staff engagement	14.9	Number of patents granted	2001-07	3,885
	Seed/PoC funds	5.4	Number of non-software licences	2001-07	7,764
	Public relations/marketing	4.3	Number of software licences	2001-07	2,962
	Collaboration/partnerships/networks	2.7	Number of spin-offs with HEI ownership	2001-07	813
	CPD, enterprise education, student enterprise and employer engagement	2.6	Number of formal spin-offs	2001-07	111
	Training/staff development	2.5	Number of staff spin-offs	2002-07	278
	Engagement support services and other internal/external KE support	2.1	Number of graduate spin-offs	2001-07	4,327
	KE units, institutes and research centres	2	Total patent stock (active patents)	n/a	8,062
	Development funds	1.6			
	General KE support costs	1.6	Free public lectures (attendees, 000s)	2004-07	1,825
	KE initiatives and projects	1.2	Free performance arts (attendees, 000s)	2004-07	1,116
	Investment in spin-outs	1	Free exhibitions (attendees, 000s)	2004-07	12,487
	Incubation	0.5	Free museum education (attendees, 000s)	2004-07	844
	Community outreach	0.3	Free other events (attendees, 000s)	2004-07	7,086
	Other KE staff	0.3	Charge public lectures (attendees, 000s)	2004-07	271
	Consultancy	0.2	Charge performance arts (attendees, 000s)	2004-07	3,100
	Awards/events/culture change initiatives	0.1	Charge exhibitions (attendees, 000s)	2004-07	2,084
Other expenditure	2.5	Charge museum education (attendees, 000s)	2004-07	254	
Unaccounted expenditure	1.6	Charge other events (attendees, 000s)	2004-07	4,128	
Number of staff days for events 2001-07 (000s)		207	Total number of attendees at events (000s)		33,196

		Gross additional income 2001-07 (£m)	Upper estimate	Lower estimate
Total HEFCE third stream funding 2001-07 (£m)	592	Collaborative research	1,373	919
		Contract research	1,231	821
		Consultancy	450	289
		Facilities and equipment	147	82
		Courses	496	302
		Regeneration/development	443	380
		IP	109	87
		All income streams	4,229	2,877
		Average additional impact	7.1	4.9

*Gross additionality excludes any displacement effects that may arise out of the knowledge exchange activity
Sources: HEBCI surveys, HEIF 4 strategies, HEFCE data, PACEC/CBR analysis

X12 Wider impacts of HEFCE third stream funding on the HEI

Third stream funding has strengthened the link between the triad of teaching, research and knowledge exchange activities undertaken by HEIs

X12.1 Third stream funding has strengthened the link between the triad of activities undertaken by HEIs: teaching, research and third stream. The flow of knowledge between these three pillars has increased as they increasingly influence each other. Knowledge exchange engagement has clear synergies with research activities undertaken by academics, with almost half of the academics surveyed believing that KE engagement has given them new insights into their work.

X12.2 Over half of the academics surveyed believed that knowledge exchange engagements have had some impact on their teaching activities:

- As a result of KE engagement, 38% of academics have changed the way in which they present the course material; this figure rises to 55% and 60% of academics in the low research and arts clusters respectively.
- A similar pattern was seen in the impact on course programme material.
- Industrial engagement for the development of course curricula is common in most engineering and applied science disciplines, although it is increasing in arts and humanities subjects.
- Enterprise education and entrepreneurship courses are also starting to appear in undergraduate and master's-level curricula.
- 16% of academics believed that KE engagement leads to an increase in the employability of their students; this figure rises to almost half of academics in the arts cluster.

X12.3 Knowledge exchange engagement is perceived to be complementary to the traditional activities of teaching and research, albeit with some academics believing that a degree of displacement has occurred because of the time constraints that most academics face.

Most HEIs collaborate to gain access to complementary capabilities

X12.4 HEIs collaborate for a variety of reasons:

- Approximately 70% of institutions do so to gain access to complementary capabilities.
- Over half of HEIs collaborate to enable them to gain access to additional resources such as funding. It is somewhat concerning that this is such an important reason for collaborating and it raises the question of whether HEIs would collaborate to anywhere near the same extent, other than for very specific instances, were such criteria not attached to funding streams.
- Collaborative ventures, both between departments within HEIs and between HEIs, are starting to help to share best practice among academics and institutions, although this could usefully become more widespread.
- Only a quarter of HEIs collaborate to gain economies of scale. One would have expected the smaller HEIs to collaborate to gain scale, in terms of facilities and other resources, and for reputation.

X12.5 Particular KE-related benefits from collaborative engagements are being realised that would otherwise likely not have arisen. For example, the cross-faculty, multidisciplinary institutes being set up are producing spin-off companies and intellectual property, and are conducting much more industrially relevant research.

Collaborative partnerships with large companies are beginning to go beyond the mere transactional towards a much more strategic partnership

X12.6 Collaborative partnerships between higher research intensive HEIs and large companies are starting to shift towards strategic partnerships. This reflects a realisation that a better understanding of the strategic direction of a large company's research will lead to more targeted research. It will also hopefully lead to more awareness of the issues surrounding the implementation of research into the company's products and processes, although much more progress needs to be made in this area.

HEFCE third stream funding is only one of a number of critical factors driving the changes to collaboration in the HE sector

X12.7 The challenges facing society and industry are inherently multidisciplinary in nature. Comprehensive solutions therefore require the expertise of more than one discipline. Demand-led multidisciplinary research centres are typically a direct response to this external driver of change. HEFCE third stream funding has facilitated this development by providing the resources for institutes to support engagements with external organisations. In addition, some successful knowledge exchange staff funded through HEIF have been instrumental in setting up large multi-partner research packages (multiple HEIs, Government, industry etc). Another key driver of change has been many funding bodies' requirement to collaborate.

HEFCE third stream funding has helped HEIs to attract other sources of funding

X12.8 HEIF funding has enabled HEIs to develop the capacity and capability to attract other sources of funding. The development of knowledge exchange offices has been one of the primary drivers in this respect. KEOs are increasingly writing the business proposals, handling contract negotiations and securing the (e.g. contract research) deals. In addition, HEFCE third stream funding is allowing HEIs to fund higher risk initiatives with potentially higher future returns. These high risks typically preclude many external sources from providing the initial rounds of funding until the benefits can be demonstrated. The demonstration effect enabled through HEIF has proven important for some HEIs to attract subsequent rounds of funding for such high-risk high-return projects.

HEFCE third stream funding has facilitated the sharing of best practice within HEIs and around the HE sector

X12.9 HEFCE third stream funding has, through a variety of mechanisms, stimulated the sharing of best practice both among academics within an HEI, and across HEIs. Critical mechanisms include the funding of knowledge exchange champions,

dissemination workshops and seminars, collaborative initiatives, and the formation of knowledge exchange associations. The HEIF-funded large-scale collaborative initiatives, such as WestFocus, have also resulted in the sharing of best practice between the partner institutions.

X13 Impacts on the external partners

Enterprises cooperate more with organisations outside the HE sector than with HEIs

X13.1 The UK Community Innovation Survey for 2004-06 reported that 10% of enterprises in the UK have cooperative arrangements for innovative activities with other enterprises or institutions. Of these cooperative arrangements, 29% are with HEIs. Interestingly, other types of partners are more common than HEIs, such as consultants, commercial labs and private research and development institutes. Enterprises are also more likely to cooperate with HEIs than to use them as a source of information. This reflects the importance of cooperation when using HEIs to improve innovative performance.

HEIs are particularly demanded by external organisations to obtain access to HEI facilities, enhance workforce and management skills, enhance technology and develop products

X13.2 The most common motivation for interacting with HEIs is to access their facilities. It is also clear from the survey evidence collected for this study, that external organisations particularly turn to HEIs to enhance their technology, increase their skills base and develop their products.

X13.3 External organisations turn to different types of HEIs for different forms of support. The six most research intensive HEIs are particularly demanded for enhancing technology, product development and increasing sales. The facilities of high research intensive HEIs are in the most demand relative to other HEIs. At medium research intensive HEIs there is greater demand than average for workforce training, management systems and graduate recruitment strategy support. There is a wider spread of demand for the low research intensive HEIs, which includes access to grants and their facilities, support for customer growth, and enhanced branding, marketing and recruitment. This is consistent with their focus on the needs of SMEs. Arts-focused HEIs are in particular demand for branding, marketing and customer service improvement.

HEIs are increasingly engaging with regional and sub-regional stakeholders

X13.4 RDAs and other regional/sub-regional stakeholders seek to engage with HEIs as they are now seen as key assets to the regional/local economy, particularly as a source of knowledge. These interactions have not only increased in number and value, but have also widened in scope and become more strategic. Furthermore, HEIs impact positively on the ability of these stakeholders to effectively deliver their economic development strategies.

Interactions with HEIs are considered highly successful by the organisations that work with them

X13.5 It is clear that organisations value working with HEIs; in the study's survey sample, over 60% considered the interactions as completely or highly successful. The success of these interactions impacts on overall organisational performance, with over half of external organisations in the survey sample reporting that they are critically or very important.

Demand from external organisations for HEI support is likely to increase

X13.6 Though potential demand from external organisations without links to HEIs is not known, almost half of the external organisations already working with HEIs plan to increase their engagement in the future. HEIs can also make further improvements in supporting external organisations. Of those external organisations which thought that the assistance offered could be improved, a key priority was for HEIs to improve their communication with them.

X14 Summary

- HEIs are in a period of transition in the development of an embracing culture and positive attitudes towards knowledge exchange engagement. It will take time for the full adjustment to pervade the HE sector.
- Initial concerns about whether the emphasis on the third mission would impact on the traditional teaching and research roles have proven to be unfounded. Many synergies between knowledge exchange, teaching and research have been realised.
- There have been modest shifts in culture and attitudes in the wider academic body of the HE sector.
- Knowledge exchange outputs have increased rapidly over the period 2001-07, with total knowledge exchange income rising by 12% per annum to £1.94 billion in 2007.
- The breadth of knowledge exchange engagement with external organisations across the HE sector does not appear to have created significant tensions among departments within HEIs.
- Between approximately £2.9 billion and £4.2 billion out of £10.3 billion generated through knowledge exchange engagements between 2001 and 2007 can be attributed to HEFCE third stream funding, either directly or indirectly. However, this almost certainly underestimates the true impact as many of the outputs cannot be monetised.
- There is greater recognition, by both academics and external organisations, of the value and benefits of working together on a highly diverse range of problems and initiatives.
- Different HEIs are finding their own unique position in the spectrum of knowledge exchange engagement, to the mutual benefit of each other. Similarly, from global corporations to micro-enterprises, a highly diverse set of firms and other types of external organisations are engaging with HEIs to solve their innovation challenges.