Knowledge exchange: A comparison of policies, strategies, and funding incentives in English and Scottish higher education

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Knowledge exchange (KE)/transfer is seen as priority areas for research and innovation policy development across many countries. What is distinctive over the past 30 years is the ‘institutionalization’ of KE between academic researchers within the higher education sector and knowledge users outside the sector, and more recently ‘incentivization’ of such activities at national and sub-national policy and at the institutional levels. Critically adopting the framework of Bozeman’s ‘Contingent Effectiveness Model’ of technology transfer, this article develops analytical frameworks in order to examine the policy conditions and dynamics through which knowledge flows and interactions are promoted. Given the recent ‘asymmetric’ devolution processes of higher education, and the UK national research policy objectives and structures, a combination of different ‘policy effectiveness models’ are pursued in England and Scotland. We show that the two higher education funding councils, the Higher Education Funding Council for England (HEFCE) and the Scottish Funding Councils (SFC), act as ‘policy transfer agent’—along with the set of relevant stakeholders, they have chosen different strategies for policy incentives and funding allocation mechanisms. One of the key challenges for each of the funding councils seems to be the establishment of criteria to distribute these funds across the sector. We discuss limits of supply side incentivization and suggest some alternative approaches by combining different policy effectiveness models and criteria.

Keywords: higher education; knowledge exchange; policy effectiveness; incentives; devolution; UK.

Promoting knowledge exchange (KE) activity and external engagement of academic researchers has been of interest to policy makers at multiple levels, including European, national and sub-national governments, and public funding bodies (Molas-Gallart and Casto-Martinez 2007; Jongbloed and Zomer 2012). KE/transfer is a strand of public policy that has developed and over the last 30 years is increasingly being seen as a priority area for research and innovation policy development in North America, Europe, and in many industrialized countries (European Commission 2007; ESRC 2009). What is distinctive over this period of time is the ‘institutionalization’ (Geuna and Muscio 2009) of KE, and more recently

‘incentivization’ (HEFCE 2011a) of such activities at national and sub-national policy and at the institutional levels. Based on public policy implementation analytical frameworks about KE policy effectiveness and measurement (Bozeman 2000; Molas-Gallart and Casto-Martinez 2007), this article aims to examine the policy conditions and dynamics through which knowledge flows and interactions are promoted between academic researchers within the higher education sector and knowledge users outside the sector.

The specific focus of our investigation is KE institutionalization and funding allocation mechanisms developed in the UK higher education, comparing the policy,

strategies and funding incentives in the English and Scottish higher education sectors. The comparison between England and Scotland highlights divergence as well as convergence in terms of the policy visions and strategies at ‘national/regional’ level with nuanced and distinctive policy conditions and institutional processes. This phenomenon reflects the recent ‘asymmetric’ devolution processes in the UK—in Scotland, Wales and to a less extent in Northern Ireland, higher education policy is increasingly becoming driven by devolved administrations whereas in England, higher education is part of the UK Governmental structure. At the UK policy level, research policy, research funding allocation, and the new research impact agenda remains centralized. Both in England and Scotland, we see similar sets of processes of *incentivizing* KE activities in parallel, underlined by common UK research and innovation policies, but also with diverging and contrasting policy rationales. The interpretation and implementation of KE policies and strategies are conditioned by different sets of policy actors at the UK level, and in England and Scotland, respectively, and by institutional architectures of individual universities—missions, strategies, resources, and the nature of the institution’s business as well as individual academics’ experiences, motivation and perceptions of opportunities as well as barriers related to their academic work environment.

Setting incentives for KE activities encompasses complex processes at the policy, institutional, and individual levels. In order to conceptualize the ways in which different sets of policy frameworks have evolved, we draw on [Bozeman’s \(2000\)](#) ‘Contingent Effectiveness Model’ of technology transfer as an analytical framework. By reviewing a wide range of literature ranging from research policy, Science and Technology studies, science communication and higher education studies, factors and processes that condition institutionalization and incentivization of KE activities are identified. This study is primarily based on the qualitative analysis of policy documents, evaluation reports, and other secondary sources, supplemented by a limited number of confidential semi-structured interviews with senior officers at funding councils, university research, and KE managers and academics in England and Scotland. We illustrate the ways in which the two higher education systems have been facing and responding to policy pressures with distinctive visions, policies, strategies, and incentive mechanisms. We argue that the sets of policy instruments and measurement tools used by the two higher education communities are converging as well as diverging from each other whereas some common policies and strategies are at work at the UK policy level.

The next sections of this article briefly review recent discussions on the concepts of KE, the impact of research, and third mission of the university in international as well as UK national policy debates; and discuss different theoretical perspectives to institutionalization and

incentivization of KE from public policy perspectives. The following sections show how policy, funding, and academic communities in Scotland and England are responding to the broad UK policy agendas differently with distinctive policy objectives, funding incentives, and indicators in a multi-level policy governance structure.¹ Qualitative documentary analysis shows the development of distinctive and diverging policy instruments and funding initiatives in English and Scottish higher education sectors over the last 12–15 years. This is followed by the analysis of funding incentives and allocation mechanisms for KE activities at Higher Education Institutions (HEIs) in England and Scotland. The final sections discuss the role of the funding councils as *policy transfer agents*. The article concludes by raising the issues about the limits of supply side incentivization, and the diverging academic identities and professional roles.

Incentivizing KE?—Governance and institutionalization of knowledge flows

Over the last two to three decades, a wide range of academic literature has grown, which investigates new ‘modes of production of knowledge’ ([Gibbons et al. 1994](#)); ‘triple helix’ university/industry/public sector linkages, and the openness of innovation business models ([Chesbrough 2003](#)). These resulted in the increased attention to the universities as actors in ‘systems of innovation’ at national, sectoral, and regional levels ([Mowery and Sampat 2005](#)). University–industry collaboration, the commercialization of research results, and the protection of intellectual property (IP) emanating from universities, have in this respect become major policy and research drivers towards the promotion of innovation and economic development ([Geuna 1999](#); [Feldman and Bercovitz 2006](#); [McKelvey and Holmén 2009](#)). Until recently, KE/transfer policy and the analysis of such policy areas has been narrowly skewed towards activities related to commercialization of research and ‘academic entrepreneurship’ ([Rothaermel, Agung and Jiang 2007](#)), mostly in science, technology, and engineering fields but for a few exceptions ([Benneworth and Jongbloed 2010](#); [Olmos-Peñuela, Castro-Martinez and Manjarrés-Henríquez 2010](#); [Meagher, Lyall and Nutley 2008](#)).

Although the term ‘knowledge transfer’ is usually regarded as an activity that promotes and deploys academic ‘know-how’ to specific users or industry sectors, there is the recognition that knowledge flows are inherently two-way processes ([Abreu et al. 2009](#)). Therefore, in recent years, the term ‘knowledge exchange’ is used in preference to ‘transfer’ ([ESRC 2009](#)). In addition to ‘knowledge exchange’ and ‘knowledge transfer’, terms such as ‘technology transfer’, ‘research mobilization’, ‘research commercialization’, ‘public engagement’ ‘research utilization’, and ‘valorization activities’ refer to

processes or activities related to different types and forms of knowledge flows and interactions, involving academic researchers engaging with external stakeholders such as businesses, policymakers, practitioners, and the general public. These are broadly termed university ‘third mission activities’ which go alongside the research and teaching missions (Molas-Gallart and Casto-Martinez 2007).

As an analytical framework, Bozeman’s (2000) model on technology transfer provides a useful starting point. Bozeman’s model focuses on ‘technology transfer’ rather than KE. We adopt his conceptualization of ‘five dimensions of technology transfer environment’ to our understanding of KE activities and processes. Bozeman (2000: 637) identified five dimensions as follows:

- *The transfer agents*: individual, institution, or organization seeking to transfer knowledge.
- *The transfer object*: contents and form of what is being transferred (tacit or codified knowledge in the form of a product, a method, a process, a design, etc.).
- *The transfer media*: means through which KT occurs, that is, whether knowledge is transferred through formal or informal mechanisms or collaborations.
- *The transfer recipient*: individual, organization, or institution receiving the *transfer object* (private individuals, firms, public sector organizations, etc.).
- *The transfer demand environment*: factors related to the *demand environment* such as market, social, cultural, and economic need for the transferred object.

In regard to *the transfer demand environment*, the common perception of European policy and academic literature is based on the notion of the ‘European Paradox’ that it is ‘lagging behind’ the USA in terms of its technological advance and innovation activities (Dosi, Llerena and Labini 2006). Many European countries and the EU have introduced legislative changes and policy initiatives to incentivize institutions as *transfer agents*, primarily targeting universities to patent and commercialize their research (Geuna and Muscio 2009; Mowery and Sampat 2005; Jongbloed and Zomer 2012). Universities have been encouraged to invest in *the transfer media*—formal *institutionalized* intermediary mechanisms for KE activities such as Technology Transfer Offices (TTOs), and Knowledge Transfer Offices (KTOs), as well as invest resources to protect their IPs and to use patenting to generate income. However, the involvement of formalized TTOs may slow down the commercialization process as the offices tend to maximize returns to the university rather than individual academics (Siegel, Waldman and Link 2003).

The literature on this topic has long had a relatively narrow commercial focus in terms of *the transfer object*, emphasizing patents, licensing, and the creation of spin-offs originating from academic research. Recent works have pointed to the much wider channels of

communication between academia and industry (Perkmann and Walsh 2007; Hughes 2011; D’Este and Perkmann 2011). Today universities are encouraged by various policy and funding instruments to actively engage in the diffusion of research-based knowledge by multiple routes, including commercial channels—licensing patents, consulting, or implementing knowledge through spin-off companies; as well as more ‘relationship-based’ knowledge transfer (KT) activities (Perkmann and Walsh 2007)—collaborative research and KE activities, commissioned research, consultancy, equipment sharing, advisory roles, joint supervision, joint publication, and student placements. Knowledge flows and exchange activities academics engage encompass much wider space than those of businesses (PACEC/CBR 2009). Universities and individual academics work with government bodies, other public, and third sector organizations (Abreu *et al.* 2009). Recent studies also draw attention to the ‘nuanced and distinctive’ role of universities as ‘public spaces’ (Lester 2005) where ‘important reflective interactions’ can be fostered with a wide range of ‘people-based and problem-solving activities’ (Hughes 2011: 412) rather than activities leading to commercial or transaction-based values. Academics get involved with different forms of KE and external engagement, and it is pointed out that this is done mostly through ‘spontaneous, endogenous’ activities (Geuna and Muscio 2009: 109).

We would question several of the underlying assumptions presented within Bozeman’s technology transfer framework. Bozeman’s *transfer object* concept includes ‘tacit knowledge’ as well as codified knowledge. However, the term ‘object’ generally implies a tangible entity, rather than an idea, ways of thinking, or framing an issue. Whereas those in universities are familiar with the concept of academic researchers producing codified *and* tacit knowledge—those outside the university environment value direct assistance in problem solving and having access to skilled experts—thus valuing the engagement and knowledge sharing with individuals. Therefore, not only the *transfer objects* academics produce, but also, the processes of engagement matter. In particular, we find Bozeman’s conceptualization of *transfer agents* and *recipients* problematic. In this conceptualization, transfer and receipt of knowledge is only on one-side—we would argue that in the KE environment, knowledge is co-created by both agents and recipients where *all* actors and agents are recipients of knowledge. Universities and individual academics act as *knowledge exchange media* themselves. Therefore the factors that influence KE, including the heterogeneity of researchers and users, are not static but interact over time, giving a dynamic dimension to the process of knowledge flows (Meagher, Lyall and Nutley 2008). Despite these limitations of Bozeman (2000)’s model, we contend that these five dimensions identified of transfer environment offer a useful starting point for discussion of the relationship between public policy and

KE environment and activity and help broaden our understanding of KE environments and processes.

Bozeman (2000: 637) presented the ‘Contingent Effectiveness Model’ of technology transfer. We apply this model to the analysis of KE activities and policy interactions. Based on Bozeman’s model, the following six types of KE policy ‘effectiveness’ are identified: *Out-the-Door*; *Market Impact*; *Economic Development*; *Political Reward*; *Opportunity Cost*; and *Scientific and Technical Human Capital*. *Out-the-Door* refers to simple reception of knowledge; *Opportunity cost* refers to the possible other impact from KE activities; *Market Impact* and *Economic Development* refer to commercial impact and spill over effects; *Political Reward* refers to the expectation of political benefits gained from participation in the KE; *Scientific and Technical Human Capital* refers to impact of KE activities on the ‘enhanced scientific and technical skills’, social capital derived from interactions, and the development of networks and infrastructure.

The original Bozeman’s model and this adopted model are schematically presented in Figs 1 and 2.

Certain sub-sets of KE ‘policy contingent effectiveness’ (Bozeman 2000) models will be selected and pursued—leading to the ‘policy effectiveness criteria’—with a set of policy objectives, indicators and funding allocation mechanisms (Molas-Gallart et al. 2002; Molas-Gallart and Casto-Martinez 2007). This process influences the KE environment through its interactive feedback loops. The development of KE policy is a key factor that conditions the whole *KE environment* as well as the perceptions and behaviour of the *KE agents* (Slaughter and Rhoades 1996). National and international policy objectives are often presented in general and broad terms sometimes with ‘ambiguity’—that is, to increase the contribution of universities to the economy and society—which is then interpreted and applied in different policy contexts through the policy implementation stage (Molas-Gallart and Casto-Martinez 2007: 323). This will then be translated into recognition, incentives, and rewards mechanisms through which the variety of routes of KE activities are re-moulded in light of certain criteria. There is a tension in connecting a set of policy objectives, priorities, and targets, and translating these back into the specific *KE environment* (Molas-Gallart and Casto-Martinez 2007: 327). The following section of the article will focus on policy and funding incentives. We show that the higher education funding councils in England and Scotland, the Higher Education Funding Council for England (HEFCE) and the Scottish Funding Councils (SFC), act as *policy transfer agent*—translating ‘policy effectiveness criteria’ into incentives, connecting them into the *KE environment* where KE activities take place through different KE agents and KE media.

As KE agents, universities are in search of a governance structure of KE activities that ‘creates the right incentives for academics’ (Geuna and Muscio 2009: 102). However, there is a danger that the variety of KE activities,

sometimes tacit in nature, would not be reflected in the institutionalization processes. Universities are left with the challenge to identify what *combination* of ‘institutional policies’ seeking to increase the volume and speed of flow of knowledge from universities to knowledge users, lead to higher rates of innovation and economic development, and meet the needs of policy, practice civil society communities, and contributes to open knowledge and free enquiry (Goldstein 2010: 13). Further, the interpretation and implementation of KE policies and strategies are influenced and conditioned by institutional values and culture of individual universities—missions, strategies, resources, and the nature of the institution’s business (Kenney and Goe 2004; Vorley and Nelles 2008; Jongbloed and Zomer 2012) as well as individual academics’ experiences, motivation, and perceptions of opportunities as well as barriers related to their academic work environment (Abreu et al. 2009; Goldstein 2010; Olmos-Peñuela, Castro-Martinez and Manjarrés-Henríquez 2010).

It is noted that those academics involved in engagement and/or policy relevant works are often motivated to do so to further their research, and some are driven by their objectives to improve society by their research (Wigren-Kristoferson, Gabrielsson and Kitagawa 2011). Olmos-Peñuela, Castro-Martinez and Manjarrés-Henríquez (2010) note a significant and positive correlation between research group involvement in KE activity and the ‘visibility of institutional incentives to promote it’. It is argued that ‘knowledge of the existence of economic incentive’ for KE is related to the degree of academics’ engagement in this activity. There are different forms of incentives, for example, including consideration of patents and licences in promotion and tenure negotiations, and allowing academics a larger share of licensing or equity revenues. Friedman and Silberman (2003) show that greater rewards to university inventors in terms of royalty income they receive *are not* significantly associated with the probability of achieving commercializable outputs. Furthermore, recent studies point out that quite often these commercial activities have resulted in a ‘net loss’ (Geuna and Muscio 2009: 109), only in a few occasions leading to significant economic returns. Therefore, what ‘economic incentive’ means for KE activities is rather ambiguous. The governance and management of incentives for university–industry interactions may ‘positively and negatively’ (Geuna and Muscio 2009: 109) influence KE activities and the flows of knowledge between the academia and the outside users.

In sum, there is a growing recognition of KE and third mission activity as an integral part of the changing nature of academic research and knowledge production (Gibbons et al. 1994). Institutions handle the implementation of KE strategies and incentives at an individual level—motivations of individual academics are multiple in nature, rather than purely economic. The reasons for engagement may range from academic (e.g. enhancing teaching and/or

Figure 1. Bozeman's 'Contingent Effectiveness Model' of technology transfer (2000: 638).

Figure 2. Bozeman's 'Contingent Effectiveness Model' applied to the KE environment and processes.

research) to economic (e.g. raising revenue for the research/department/universities); from accountability to betterment of the world (e.g. pursuing social responsibility for publicly subsidized research; improving policies practice or public awareness through the better use of research). There are factors inhibiting 'supply side' KE activities including 'traditional indicators of recognition

and impact'. Also there are factors depending on academic disciplines, career stages, institutional pressures, and personal motivations (Stephan and Levin 2001; Jacobson, Butterill and Goering 2004; Poliakoff and Webb 2007). Understanding of incentives needs to be based on a view that knowledge production and innovation processes are 'interactive processes with numerous

feedback loops' (Jongbloed and Zomer 2012: 99–100) rather than a linear process.

The UK KE policy landscapes—higher education policy, devolution, and multi-level institutionalization of impact and KE

In this section, the transformation of the KE policy landscape is reviewed at the UK national policy level, and then we look at the English and Scottish policy implementation and incentivization processes through funding initiatives in each system. The recent process of political devolution adds some nuance to the KE policy development and implementation processes. The effects of 'regional devolution' on higher education, research funding, and the governance and management of KE are a growing area of policy concern (Ozga and Jones 2006; Lyall 2007; SFC 2007; Huggins and Kitagawa 2012). Although the divergence of higher education policies with the four different funding bodies predates devolution in the UK, this has become more marked over the last decade (Universities UK 2008). Nevertheless, while some powers and responsibilities related to science and innovation policy are devolved to regional governments, national (and transnational) governments still tend to retain a significant influence on science and research policy. Although research policy is governed at the UK national level, with policy interactions and funding at the European level, the higher education policies and KE policy landscapes have been developed and diverged in England and Scotland over the last decade.

The spatial governance of higher education, research, and innovation policies in the UK is rather complex and asymmetrical. The Funding Councils in England, Scotland, Wales, and the Department for Employment and Learning (DEL) in Northern Ireland, have provided funding for HEIs; which include funding for teaching, a component of research funding (known as 'QR') and infrastructure. In addition, the funding councils have provided initiatives to build institutional platforms to promote KE activities in each higher education system (Table 1). The provision of funding to support KE from the funding councils is relatively small compared to support for research and teaching. In England, through the HEFCE, a series of funding initiatives have been provided to promote 'third mission' activities. In Scotland, the SFC funds both higher education and further education sectors including KE activities. Research policy and research funding allocation mechanisms operate at the UK national level. Within the Department for Business, Innovation and Skills (BIS), the Government Office for Science has responsibility for the HEFCE, the Research Councils, and the Technology Strategy Board (TSB). The Research Councils fund research at HEIs in England, Scotland, Wales, and Northern Ireland. The institutional multi-level dimensions

of these policy and funding environments have conditioned different models of KE between different actors constituting multi-spatial innovation systems.

At the UK national level, there have been distinctive policy developments connecting innovation agenda and higher education. The 1998 Competitiveness White Paper *Building the Knowledge-driven Economy* (DTI) stipulated the importance of science and technology in an increasingly competitive world. The Science and Innovation White Paper in July 2000 (DTI) and the Enterprise, Skills, and Innovation White Paper (DTI/DfEE) in February 2001 both recognized the crucial role of HEIs in the economy as powerful drivers of innovation and change. Also at national level, the intertwined areas of KE activity and research impact have been developing. Following the *Lambert Review of Business–University Collaboration* (2003), it was recommended that research councils increase their economic impact and improve public health and quality of life through the research they fund. Following this, the RCUK's *Excellence with Impact* and *Public Engagement with Research Strategy* reports were published calling for pro-active KT, engagement and connectivity with users (RCUK 2007, 2010). The Sainsbury Review *The Race to the Top* (Sainsbury 2007) recognized that significant progress had been made since the Lambert Review.

After the world financial crisis and recession in 2008–9, increased public spending restraint and demands for accountability mean that the higher education sector is under increased pressure to support the utilization of the research it produces and to identify, measure, and demonstrate its impact and relevance of the research. This has led to 'Pathways to impact' of proposed research for the research councils. Furthermore, under the new Research Excellence Framework (REF) exercise, 'impact assessment' is being added to the process of peer-reviewed research evaluation (HEFCE 2011c; Hughes 2011; Martin 2011). Universities are also expected to provide short-term skill focused, and local demand focused provisions for innovation and economic growth to the employers and business communities (Kitson et al. 2009). The recent *Wilson review of business–university collaboration* (2012) highlights the role of universities in improving the employability of graduates. These broader research policy and funding landscapes evolving at the national level affect knowledge flows from the university to the outside users, and the way these knowledge flows are perceived, measured, and incentivized.

Comparing institutionalization and incentivization of KE activities in higher education in England and Scotland

The Funding Councils have played a key role in supporting and enhancing the institutional capability of KE

Table 1. Size of HE funding bodies' grants in England, Scotland, Wales, and Northern Ireland (2010/11)

Country	Universities	HEIs	HE funding bodies	Teaching funding (million)	Main QR from funding councils (million)	Main KT Grant from funding councils (million)
England	89	131	HEFCE	£4710	£1600	£150
Scotland	14	19	SFC	£677.6	£240.4 (09/10)	£22
Wales	10	11	HEFCW	£260.2	£79.5	£8.2
Northern Ireland	2	4	DEL	£137	£51.9 (09/10)	£3
UK	115	165				

Compiled by authors based on HEFCE, SFC, HEFCW, DEL websites and <<http://www.publications.parliament.uk/pa/ld200910/ldselect/ldsctech/104/10413.htm>> accessed 10 June 2012.

activities. One of the key challenges for each of the funding councils seems to have been the establishment of criteria to distribute these funds across HEIs, and different measurement and funding allocation mechanisms have been developed, tried, and implemented in England and Scotland, respectively. HEIs have been playing the important role in developing the KE funding mechanisms along with the funding councils (HEFCE and SFC) and government ministries (e.g. Treasury, BIS, Scottish Government (SG)) and other organizations related to innovation, economic development, and KE (e.g. TSB, Scottish Enterprise). The KE policies in England and Scotland have been somehow diverging from each other. This is distinctive in terms of (1) shift of emphasis between competitive project bidding and formulae-based funding; and (2) emphasis of policy incentives between individual institutional KE capacity building and collaborative institutional KE capacity building. However, both systems seem to be shifting the policy emphases to 'KE performance' and 'KE outcomes'.

England

In England, the HEFCE provides funding for 'third stream' activities, which refers to 'interactions between HEIs and external organizations in the private, public, and voluntary sectors, and wider society' that supports the transfer and exchange of knowledge between HEIs, business, and the wider community (PACEC/CBR 2009). Since 2001, the HEFCE has been carrying out an annual survey, initially called the *Higher Education Business Interaction (HEBI)* survey, and was later renamed the *Higher Education—Business and Community Interaction (HEBCI)* survey. The survey collects data on a broad range of third mission/KE activities encompassing the contributions of universities to both economy and society, covering all the HEIs in the UK including England, Scotland, Wales, and Northern Ireland. The survey has been developed over the past decade, and with the development of the formulae for funding allocation in England, the use of HEBCI data has become explicit part of the

policy goals. Now the objectives of the survey are identified as (HEFCE 2011b: 11):

- (1) to provide data on the continuing development of interaction between HEIs, business, and the community;
- (2) to provide reliable and relevant information to support the continued public funding of the third stream of HEIs' activity in the UK;
- (3) to give HEIs good benchmarking and management information; and
- (4) to develop a source of indicators at the level of the individual HEI, some of which will be useable to inform funding bodies' allocation of continued funding.

The third stream funding in England has grown over the past decade, as summarized in Table 2. Following the government White paper in 2000, the HEFCE and DTI announced the creation of the *Higher Education Reach-out to Business and Communities (HEROBC)* fund in order to encourage universities to work with business and communities in their regions. This was followed by a series of rounds of *Higher Education Innovation Funds (HEIF)* in 2001 (HEIF1: £78 million, 89 awards), 2003 (HEIF2: £187 million, 124 awards.), 2005 (HEIF3: £238 million), 2007 (HEIF4: £404 million 2008–11), and 2010 (HEIF5: £600 million 2011–5).

In the White paper *Future of Higher Education* in 2003, the third stream funding was boosted with funding from the HEFCE and DTI/OST. Earlier rounds of HEIF funding were based on project-based competitive bidding, and a number of projects were funded for regional consortium of HEIs. However, the project-based nature of the funding created 'long-term instability' and prevented the development of the long-term institutional strategies for KE and third mission activities. The HEFCE commissioned exploratory works trying to determine the 'impact' of project-based funding around this time while trying to develop new indicators for the future formula-based funding (Molas-Gallart and Casto-Martinez 2007).

Table 2. HEFCE third stream funding (source HEFCE website)

Year	Funding programme	Funding awarded (£million)	
2000–3	HEROBC 1st phase	62	Competitive bidding
2000–4	HEROBC 2nd phase	22	Competitive bidding
2001–4	HEIF1	78	Competitive bidding
2004–6	HEIF2	187	Competitive bidding
2006–8	HEIF3	238	75% formulae based
2008–11	HEIF4 including CKEs	404	100% formulae based
2011–5	HEIF5	600	100% formulae based

HEIF funding mechanisms had been gradually changed to formulae based. Under HEIF3, 75% of HEIF was allocated on a set of 12 indicators derived from a variety of sources (Molas-Gallart and Casto-Martinez 2007: 325). In 2005, the HEFCE broadened the scope of data collection in HEBCI in order to include forms of social exchange to the traditional business interaction indicators. Allocation was made to all HEFCE-funded HEIs if there is a KT plan, while 11 awards were made through competition to innovative significant scale projects. Additionally, 22 Centre for Knowledge Exchanges (CKEs) were funded until 2009. In the evaluation made in 2006/7, it was noted that third stream activities were much improved and HEIs were strongly committed to develop these activities as their core activity (Quotec 2007).

Under HEIF4, all HEIF funding moved to the formula funding. The first component (40%) of the formula was based on the number of staff, related to ‘capacity building and potential’. The second component (60%) was based on the performance and value of the KE-related income metrics. These included: *contract research; consultancy income; income from business and community use of equipment and facilities; income for local and regional development and regeneration; IP income; external income for CPD courses; and Knowledge Transfer Partnerships (KTPs)*. Income from small and medium enterprises (SMEs) was double-weighted throughout. The HEFCE stressed in the strategic plan that their objective is to build the third stream into every HEI ‘distinctively and appropriately with their mission’ (HEFCE 2008). The report for the HEFCE analysing HEIF4 noted that top methods of engaging academics include: ‘incentive schemes’, ‘revisions to recruitment and promotion criteria’, and ‘training and development’. Some form of monitoring systems is in place in most HEIs although many have no or limited mechanisms in place to ‘evaluate engagements’ in KE (PACEC/CBR 2009). In England, between 2003 and 2010, £877 million was allocated for KE activities through the HEFCE, the big share of which is dedicated during 2008/9–2010/1 to the recruitment and retention of dedicated KE staff, as well as training and staff

development (PACEC 2012a). Formula funding was seen to enable HEIs to build their own strategic approaches and help embedding KE activities in the institutions.

Under the current HEIF5 (2011–5), institutional allocations are calculated based solely on performance metrics. This reflects both the HEFCE’s policy that the allocation of HEIF should move towards ‘performance’ (as stated in HEFCE 2008), and the government’s reform of HEIF. This also takes into account that funds for ‘capacity-building’ have been provided over 5 years, in HEIF rounds 3 and 4, and the ‘focus in tighter fiscal times must be on successful delivery’ (HEFCE February 2011). As part of this shift, funding for staff numbers as a measure of potential capacity was discontinued. HEIs are eligible if they exceed a threshold related to earnings from external income.

Under HEIF5, not all institutions are eligible to receive KE funding—some HEIs will gain significant funding and others lose funding, and some will not be funded (HEFCE 2011d). The performance metrics and data sources used in calculating institutional allocations are following those used in HEIF4, largely drawn from the HEBCI survey. Again, one of the key policy priority areas is the work with SMEs—in the performance metrics, HEIs’ income from SMEs are ‘double weighted’.

In earlier phases, HEIF had developed through rounds of project funding that supported ‘innovation and demonstrated good practice in KE’, then it moved to a formula that included a ‘capacity-building’ element (calculated on staff numbers), and then the focus seems to be shifting towards ‘delivery, and rewarding and incentivizing performance’ (HEFCE 2011d). It is interesting to note that the most significant increases in income have been with ‘non-commercial partners’ such as those in the public and third sectors, charities, and social enterprises (HEFCE 2011b: 2).

Scotland

In Scotland, since 2001/2, the Knowledge Transfer Grant (KTG) has been the main funding stream for KT/exchange in Scottish HEIs, in order to provide universities with a flexible funding stream to support a variety of KE activities. In Scotland, a clear framework of outcomes and indicators for the public has been established since 2007, called the National Performance Framework. One of these outcomes is to ‘Improve knowledge transfer from research activity in universities’ (Scottish Government 2007). Performance on this indicator is based on KTG metrics from HEIs. The reporting mechanisms have been evolving with the changes of the funding mechanisms (Table 3).

The SFC’s corporate plan objectives include improving ‘the flow of knowledge, expertise and ideas, to businesses, enterprises and public services’ and seeking to ‘work with key partners to develop KE activities that enhance

Table 3. SFC KE funding

Year	Funding programme	Funding awarded (£ million)	Allocation mechanisms	Competitive strategic KE funding for priority areas
2001–2	Knowledge Transfer Grant (KTG)	5.7	Formulae based	
2002–3		6.3	Formulae based	
2003–4		6.5		
2004–5		9.5	Allocated against KTG income metrics	
2005–6		12.5		
2006–7		16.0		
2007–8		19.1		
2008–9		21.5		SPRIT was created with £2 million
2009–10	GFU and HFU created	24.1	Baseline allocation of £70,000 under GFU; HFU (£21 million) - £6 million allocated to strategic project; £15 million by KTG metrics	SPRIT increased to £3.8 million
2010–11	GFU and HFU	25.9	Baseline allocation of £70,000 under GFU; HFU (£21 million) - £6 million allocated to strategic projects; £15 million by KTG metrics	

Source: SFC website compiled by authors.

innovation in public policy and practice in Scotland and strengthen the policy community' (SFC 2006). The KTG increased from £5.7 million (2001/2) to £21.5 million (2008/9). In 2009/10, KE funding was restructured as a result of the creation of the General Fund (GFU) and Horizon Fund (HFU).

All universities receive a baseline allocation (£70,000 per annum in 2011/2) to support a dedicated capacity to deliver KE projects from the GFU; and a performance-related allocation based on KTG metrics towards KE income and other public outreach activities. This is from the HFU (the total budget for this element is currently ~£13.8 million per annum). There is another set of mechanisms for supporting KE through the HFU. This fund was established in 2009, following the work of the 2008 Joint Future Thinking Taskforce on Universities, specifically to help HEIs focus on the 'demand-led' KE activities in line with the SG's strategic priorities (SFC 2010).

In 2008/9, under the HFU, the SFC ran a competition, called Strategic Priority Investment in Research and Innovation Translation (SPIRIT), for proposals addressing the needs of Scotland's key industries (life sciences, energy, financial and business, creative industry, and food and drink, and tourism), and the policy community. Under SPIRIT and the HFU KT, total of 20 projects were funded for projects that address the needs of industry in Scotland with ~£14 million of SFC funding for 2009–13. According to the report on the evaluation of SPIRIT projects in 2009 and 2010, 'greater coherence' in the interactions between universities and their industrial partners and 'improved capability' among academics to get involved in KE activities are noted (PACEC 2011).

There are also funding initiatives targeting 'demand-driven' exchange of knowledge such as the Innovation voucher scheme, aiming to develop relationships between SMEs and HEIs. *Interface* is a programme funded by the SFC, which provides a 'matchmaking' service to Scotland's research base and businesses, particularly, SMEs.

In 2010, there was a consultation between the SFC and a number of stakeholders including universities, Universities Scotland, University and College Union Scotland, and the RCUK. The SFC intended to increase the proportion of funding allocated to 'strategic projects' claiming that formula-based funding allocation 'have not resulted in a strong, strategic focus on Scotland's biggest challenge or opportunities' (THE 19 June 2010). Universities were against this plan arguing that project-based funding is not sustainable, while there was no consensus on whether a higher or lower proportion of the HFU should be distributed on a project-based funding.

In order to meet the SG's policy objective 'Improve KE from university research' a joint SFC/Universities Scotland Knowledge Exchange Reporting Working Group (KERWG) was established in October 2010 to develop a reporting mechanism for formulaic KE funding (Universities Scotland and Scottish Funding Council 2011). The SFC's *Knowledge Transfer Metrics Return* records the income received by all SFC-funded HEIs from KE activities, designed as a 'means of allocating a grant for knowledge exchange', rewarding them for the volume of income from their historic KE activities. Under the SG weightings, a high weighting is given to activities which demonstrate actual KE linkages

between universities and businesses, such as research, commercialization, consultancy and provision of continuing professional development whereas a medium weighting is given to external research grants from public bodies to exchange their knowledge with public sector bodies. A zero weighting to all publicly funded activities to stimulate KE, such as European Structural Funds and Scottish/UK KE grants in order to ensure any change in the index is not directly influenced by a change in public funding under the SG weighting, whereas the SFC weighting rates these activities higher (Table 4).² In particular, HEIs are asked to have in place procedures to identify interactions with SMEs.

The SFC is going to establish an ‘outcome agreement’ with each university identifying targets and specific outcomes of some of the KE activities as conditions of grants.

KE policy effectiveness?: Connecting incentives and impact on English and Scottish HE systems

We have illustrated the evolution of the UK *KE environment* over the last 15 years with a series of national policy initiatives to enhance flows of knowledge between science and businesses and wider society. In the case of the UK, the ‘national’ policy landscape has become complex with devolved multi-level policy governance structures, through which the evolution of the sets of policy initiatives have developed in England and Scotland. In the ‘translation’ process of the national policy objectives, the devolution of higher education policy has resulted in the different institutionalization and incentivization processes in English and Scottish higher education sectors.

The national policy objectives and targets are based on selected types of ‘policy effectiveness’ (Bozeman 2000). The two funding councils, the HEFCE and the SFC, in consultation with other stakeholders, translate ‘policy effectiveness criteria’ into metrics and indicators for funding allocation mechanisms affecting the whole KT environment. However, the relationship between indicator collection and funding incentives has been a major concern for both higher education systems. Impact of KE occurs over a period of time, and as the result of multiple interactions in the ‘feed-back loops’, and there are time lags and multiplier effects. There remain a number of methodological as well as analytical issues in how to connect policy objectives to the indicators and metrics. In both England and Scotland, for example, the reporting mechanisms appear to give ever greater recognition of income generating activities and activities which deliver direct economic development objectives rather than wider societal and cultural benefits, although these are often acknowledged as important areas of contribution of HEIs to ‘public goods’.

As already presented, drawing on the work of Bozeman (2000), six types of KE policy ‘effectiveness’ are identified: *Out-the-Door*; *Market Impact*; *Economic Development*; *Political Reward*; *Opportunity Cost*; and *Scientific and Technical Human Capital*. The KE funding initiatives have developed over years in both England and Scotland—both HEIF and KTG—the criteria and metrics of which have been based on different types of policy effectiveness embedded in each policy environment. First of all, both funding incentives mean ‘political reward’ for the HEIs—by participating in the KE funding, institutions had increased funding, which is typically the case for project-based funding. The SFC tried to increased ‘political reward’ by increasing the project-based projects and the revised KTG metrics shows more targeted ‘political reward’ approach. Both HEIF and KTG have used ‘market impact’ and ‘economic development’ as effectiveness criteria, using these performances as metrics for the formulae-based funding allocations. In particular, there is a strong alignment in Scotland in the priority industry of Scottish economy (PACEC 2012b).

Taking on new missions inevitably change the scientific culture and educational practices of universities (Bozeman 2000) and the way knowledge is produced and co-produced. How to systematically capture the *Opportunity Cost* is a pragmatic concern among policy evaluation practitioners and it is also a conceptual challenge for academics analysing KE activities and impact of research (Nutley Walter and Davies 2007). Capturing KE activities under the *Scientific and Technical Human Capital* effectiveness model (Dietz and Bozeman 2005) provides another analytical as well as methodological challenge. KE-related human capital seems to be recognized as key part of the policy effectiveness criteria of both HEIF and KTG funding allocation—the big amount of KE funding in both England and Scotland has been spent on the recruitment and retention of the dedicated KE staff, as well as training and staff development more in general (PACEC/CBR 2009). However, the sustainability of KE institutional capacity may be an issue for some HEIs. The HEFCE seems to move its emphasis of policy effectiveness from ‘capacity building’ to ‘effective delivery’ of KE activities (PACEC 2012a). Under the new eligibility criteria, not all HEIs in England are eligible to HEIF funding. In Scotland, the growth of dedicated ‘KE brokers’ have been noted (Knight and Lightowler 2010), but there remain a number of issues about the career development and progress of these professional staff.

In this article, two sets of different responses from the funding councils, that shows different roles and functions of funding councils as *policy transfer agents*. Firstly, it is interesting to note that while the HEFCE decided to move away from project-based funding allocation to formula/metric-based KE funding allocation, the SFC has tried to move to an opposite direction. The SFC had started from formula-based allocation based on KTG metrics, and tried

Table 4. KE metric

KE metric	SFC weight	SG weight	KE metric	SFC weight	SG weight
External research grants and contracts (UK/non-UK industry, SMEs, and other sources)	2.25	1.0	Proof of Concept Fund	4.0	0
Consultancy	3.5	1.0	Enterprise Fellowship	4.0	0
Continuing Professional Development	2.5	1.0	Teaching Company Scheme	5.0	0
Licensing	1.5	1.0	Faraday Partnership	4.0	0
Venture capital	1.0	1.0	LINK and Foresight LINK	4.0	0
External research grants and contracts (UK central government/LAs, health, and hospital authorities)	2.25	0.5	University Challenge Fund	1.0	0
European Structural Funds	5	0			

Source: SG website (2012).

to increase the project-based allocation in order to achieve their strategic policy, focus, and objectives. In the case of Scotland, the metric-based system was designed and developed over the years to ‘differently reward’ universities based on their performance against the priorities of the SFC and the SG. After the KE consultation in 2010, the SFC decided to keep metric-based funding as the core, while a limited amount of project-based funding was introduced. It is a balance between the metric-based system which was designed to ‘reward universities for what they have actually done’, and the project-based funding that ‘will fund universities for what they say they plan to do’.³ The English funding model moved away from project-based to metric model, arguably emulating the original metric model in Scotland. The evaluation of HEIF seems to confirm that the metric-based approach has brought focus to the KE agenda and has embedded KE as a higher priority in institutional missions (HEFCE 2008).

Secondly, while the Scottish higher education sector tends to take collective and unified approach to ‘excellence’, the English approach, especially under the current Coalition government, is principally driven by the objectives and missions of individual institutions. It is notable that Scotland has managed to create ‘research pooling initiatives’ and demand-led KE initiatives such as Innovation Voucher schemes (SFC 2010). In England, with the abolition of Regional Development Agencies (RDAs), the regional governance mechanisms of research commercialization and business engagement support seem to be rapidly disappearing. These would impact on the relationships between local authorities, local economic development, and higher education sector in England and Scotland, respectively.

These broad policy pictures sketched here on the recent evolution of the KE funding incentives provided by the funding councils give only half of the story. While the funding councils in England, Scotland, Wales, and the department in Northern Ireland principally support building institutional infrastructure and ‘capability’ (and

more recently, ‘outcomes’) of KE activities, the research councils at the UK level provide resources for ‘activities’ related to research and impact. The current impact agenda cuts across research and KE policies. How the RCUK ‘Pathways to Impact’ and the REF impact assessment will affect the entire *KE environment*—including academics’ motivation, strategies, and practices as well as the choice of *KE media* and the nature of *knowledge*. Benefits as well as cost of these initiatives need to be investigated and documented for future policy (Martin 2011)—rigorous evidence is required to investigate the ‘effectiveness’ of the ‘policy effectiveness’ models.

Finally, Hughes (2011: 438) raises the issue about the ‘limit to the absolute capacity of individuals or the current system to take on further activity without hitting capacity limits.’ In particular, incentivization mechanisms need to be realistically designed in light of the supply side (i.e. academics) capacity as well as capacity limits on the business side, too. Recent studies seem to confirm that for businesses, the actual role played by university research is rather limited as ‘sources of knowledge’ for innovation (Cosh and Hughes 2010). For businesses, knowledge sources are found within the business, customers, and suppliers rather than from university research, and knowledge sources are often combined, for example, with the use of intermediary institutions, and private–public organizations (Hughes 2011). More understanding is needed regarding the knowledge sources for other users of knowledge, such as the government and third sectors and the role played by universities and other intermediaries.

In order to overcome these issues, new forms of KEs need to be nurtured, acknowledging ‘boundary differences’ between the academia and the user communities especially regarding motivations, incentives, and timescales (SFC 2007). There are a number of good examples of demand-led exchange of knowledge between industry and academia: non-academic ‘in-residence’ professionals from local communities, policy communities; industry (e.g. Professors of Practice); forms of secondment; and PhD placements may be pursued in combination with

other forms of KE activities. These may be effectively linked to the career development of researchers (Vitae 2012) as well as professional development of non-academic knowledge users. The scope needs to be broader than industrial KE activities, including interactions with governments, communities, and third sectors—recognizing KE as ‘public goods’ and broader human capital development.

Conclusion

This exploratory article examined the KE policy processes in the UK over the last 15 years, in particular focusing on the development of KE funding initiatives from the funding councils, targeted to develop institutional KE capacity and embedding KE activities into the institutional missions.

Different institutional arrangements across countries and regions lead to the local coalitions of stakeholders. Building on the frameworks drawing from public policy literature, we examined the policy development and funding institutional arrangements in the UK, more specifically, those in England and Scotland, and identified specific as well as generalizable lessons for policy communities, funding communities as well as academic communities in evaluating and designing incentive mechanisms for KE activities.

This article developed the conceptual framework proposed by Bozeman (2000) by highlighting the connection between ‘policy effectiveness’ and KE environment. We compared and analysed the roles of the funding councils as *policy transfer agents*, translating the policy effectiveness models into certain indicators and metrics for funding allocations that influence the KE incentivization processes at HEIs. Against the multi-level national policy objectives and structures, different ‘policy effectiveness models’ are pursued in both England and Scotland; each of the policy transfer agents, along with the set of relevant stakeholders, have chosen different institutionalization and incentivization strategies for funding allocation mechanisms for capacity building and embedding KE in institutional architectures.

The incentivization processes at the policy level have involved strategic balancing and choice between project-based and metric-based funding allocation. The institutionalization processes have taken different forms—while the Scottish sector has taken a collective policy-goal-driven approach, the English approach has been increasingly institutionally driven. An inherent and unresolved problem in both of the systems is the difficulty of systematically capturing broader ‘socially’ and/or ‘non-transaction’ oriented KE activities with appropriate metrics and indicators. In both systems, metrics and performance indicators and the underlying policy effectiveness models have been skewed towards *Market Impact* and *Economic Development*. This would influence and

impact on the practices of HEIs and individual academics. There are potentials for broadening the performance indicators for KE activities, by strategically combining and selecting different policy effectiveness models, in particular, *Political Reward*; *Opportunity Cost*; and *Scientific and Technical Human Capital*.

The design of incentives needs to be part of the interactive processes with numerous feedback loops between policy, funding incentives, and institutional structures. Moving on to another level of implementation/translation processes in the *KE environment*, the series of evidence seem to show that institutions are embedding the KE activities into their institutional strategies as the result of recent KE policy and funding initiatives (HEFCE 2008; PACEC/CBR 2009, 2011). The effects of these policy and funding incentive mechanisms on individual academics working in different disciplines, working within ‘different types of universities’ by regions are presented in a recent study (Abreu et al. 2009: 43). Given the diverging policy emphasis, funding, and incentive mechanisms developed in devolved higher education systems, and the centralized research and impact policy structures and research funding allocation mechanisms in the UK, it is of interest to see the effects and impacts of these institutionalization and incentivization processes further. Questions may be raised regarding the new and diverging roles of academics; the changing relationships between research, teaching and the so-called third mission activity; and the mechanisms through which institutions respond to these changes. This article has illuminated evolving policy contexts in the UK, and presented an analytical framework and methodological issues to set further empirical analysis.

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Notes

1. Some of the conceptual frameworks and policy analyses presented in this article were initially developed in the project conducted by the authors in 2011–2, summarized in the project report (Kitagawa and Lightowler 2012).

2. <<http://www.scotland.gov.uk/About/Performance/scotPerforms/TechNotes/knowledge>> accessed 18 Jul 2012.
3. KE Consultation: Response form <http://www.sfc.ac.uk/web/FILES/Consultations_SFC012010C_Responses/_University_of_Glasgow.pdf> accessed 16 Jun 2012.

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